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THE TABULAR VIEW

BEFORE the arcana of modern physics the layman stands bewildered, and rare is the expositor who can interpret for him the mysteries of atomic research. In evidence that such expositors do exist, we present this month PHILIP M. MORSE, whose lucid and clarifying article on the neutron appears on page 179. Dr. Morse, an Associate Professor in the Institute's Department of Physics, is a graduate of the Case School of Applied Science and recipient of a doctor's degree from Princeton. While at Princeton he published numerous papers, several of which were in collaboration with President Karl T. Compton, on theoretical interpretation and mathematical formulation of phenomena of discharges through gases. He is the author of several important theories dealing with the spectra, dissociation and energies of chemical molecules, and is co-author of the first book in English on wave mechanics. In the year 1930 to 1931 he was at the University of Munich as an International Research Fellow. ¶MAYO D. HERSEY, '09, ("The Oil-Shed Fallacy") in November and December delivered ten public lectures at Technology on the mechanics of lubrication. After graduation from the Institute, he held positions as physicist with the National Bureau of Standards and as Associate Professor at the Institute. Since 1922 he has been, successively, physicist in charge of the physical laboratory of the United States Bureau of Mines, chief of the friction and lubrication section of the Bureau of Standards, and mechanical engineer and head of the engineering physics division in the research and development department of the Vacuum Oil Company, Inc. He was appointed research associate in engineering at Brown University in 1934. Among the many professional societies of which he is a member are the American Society of Mechanical Engineers, American Society of Naval Engineers, American Physical Society, Washington Academy of Sciences, Society of Rheology (Vice-President), and the American Petroleum Institute. He has been chairman of the Research Committee on Lubrication of the American Society of Mechanical Engineers and has served on various other committees of this Society and of the National Advisory Committee for Aeronautics.

A YEAR ago The Review published "A Canapé of Conundrums" and so great was the interest manifest by readers in these amusing brain teasers that we commissioned P. J. RULON to confect the new collection which we present on page 184. Sharpen your pencils, or better, your wits, and when you have solved the posers, try them out on your friends. Dr. Rulon is an Assistant Professor in the Harvard Graduate School of Education where his field of instruction includes statistics, test constructions, and educational experimentation. Dr. Rulon sometimes will admit that in 1932 he published a book of brain teasers under the pen name of Julian Longstreet. Perhaps there's some enigma about this pseudonym. ¶Contributors to "The Trend of Affairs" this month include EDWARD S. (*Concluded on page 166*)

THE TABULAR VIEW

(Concluded from page 165)

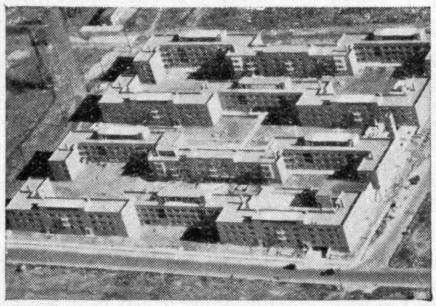
GILFILLAN, JR., Research Associate in chemistry at the Institute and a member of the staff of Arthur D. Little, Inc. ("Oil's Origin"), and FREDERICK G. FASSETT, Assistant Professor of English at Technology ("Extrapolating Existence").

Announcing THE COVER CLUB

PHOTOGRAPHS selected for reproduction on the cover of The Review are held to high standards. They must have attention-getting value, and therefore must be pictorially epigrammatic; they must be adroitly composed to keep the whole cover pattern balanced, and therefore must be carefully studied by the photographer; they must symbolize the contents of The Review, and therefore must relate to science, industry, architecture, or engineering; they must show the familiar in a way the average eye does not normally see it or the unfamiliar in a way that is convincing and telling, and therefore must represent discernment and ingenuity; and they must embody a beauty of their own, and therefore must be imaginative and esthetically satisfying.

Because these standards prevail, the amateur photographer who has a print reproduced on our cover has attained, we like to feel, a measure of distinction in his work that warrants special notice. We propose to give this recognition in this column each month, so far as possible, and by way of doing this, we announce the formation of the Cover Club, the membership of which will include those amateur photographers whose work is printed on the cover. Membership in the Club is limited to amateurs — those contributors who do not make photography their chief business. We thus discriminate against commercial photographers, not because we do not wish to give recognition to the fine work so many of them achieve (we use many prints from professionals), but because the amateur, not working for monetary return, deserves a return in the form of recognition and appreciation. We wish to encourage the amateur photographer, not only to cultivate high standards in his photography, but to submit prints to The Review for consideration as cover subjects (and for use on inside pages, too!).

COVER CLUB member Number 1 is LEWIS P. TABOR, '22, whose photograph of the Philadelphia-Camden Bridge, "Riverfront", graces our jacket this month, and who has other fine prints reproduced in this issue (pp. 172 and 183). Mr. Tabor is head of the Science Department, Episcopal Academy (of which Greville Haslam, '15, is head master), Overbrook, Penna., and in his spare evenings may be found at the Roslyn House Observatory, which explains his star-field pictures, examples of which appear on page 183. The cover photograph, Mr. Tabor reports, was taken with a small camera ($1\frac{5}{8}$ x $2\frac{1}{2}$) and the print reproduced was a bromide. The print has been exhibited by The Miniature Camera Club of Philadelphia.



Carl Mackley Houses, Juniata Park, Philadelphia

HOUSING DEVELOPMENT ATTAINS FUEL ECONOMY

Installation of Webster Moderator System Provides Uniform Heat in PWA Project

REGULATES STEAM SUPPLY

Philadelphia.—For the all-important heating job in the new Carl Mackley Houses, the first of the new, large housing projects actually to be occupied, a Webster Moderator System of Steam Heating was selected.

This group of four buildings is substantially constructed of durable materials—built for long life, with the most modern equipment. It covers an entire block at Juniata Park in the northeastern section of Philadelphia.

The need for a central heating system that would provide healthful comfort free of overheating for nearly 300 families, coupled with the necessity for low annual operating cost, led the engineers to specify the Webster Moderator System of Steam Heating.

The system provides "Control-by-the-Weather," a single Outdoor Thermostat automatically adjusting the steam delivery for changes in outside weather conditions. Accurate orificing of all radiators assures even distribution, all radiators receiving heat at the same time and in amount proportionate to size.

Heating and plumbing plans for the development were prepared by Harry J. Eggly, Jr., Consulting M. E. The installation was made in the fall of 1934, with T. J. Kelly, Inc., acting as plumbing and heating Sub-Contractor, under Turner Construction Co., General Contractors. Architectural plans were made by Kastner & Stonorov and W. Pope Barney.

The financing of the project, including a $1,039,000 loan from the Public Works Administration, was sponsored by the American Federation of Hosiery Workers.

The suitability of the Webster Moderator System for large-scale, low cost housing has led to its adoption in other outstanding developments of this type. Now under installation are Webster Moderator Systems for the Techwood and University Housing Projects in Atlanta, Georgia, both 100 per cent federally financed slum elimination projects.

Lexington Building, Baltimore

STEAM COSTS REDUCED IN 21-STORY BUILDING

Webster Moderator System Helps Baltimore Building to Cut Heating Costs 40 P.C.

ECONOMIES INCREASE YEARLY

Baltimore, Md.—A five-year study of the cost of heating the 21-story Lexington Building reveals the savings possible with the Webster Moderator System after an alert building management has corrected all apparent sources of heat loss.

In two years before Webster Heating Modernization, the management reduced annual steam consumption from 32,800,000 lbs. to 20,400,000 lbs. These savings were accomplished by segregating those portions of the building requiring 24-hour service, shutting off the steam completely in sections when they were not occupied and making a number of small adjustments in steam circulation.

This was the situation prior to heating modernization in the summer of 1930.

With the Webster Moderator System, the Lexington Building used only 16,840,000 lbs. of steam during the ensuing season. With more experience in operation and minor changes in the control equipment, the management further reduced steam consumption to 13,400,000 lbs. in the second season and 12,100,000 lbs. in the third.

The experience of the Lexington Building demonstrates the increasing economies that can be realized year after year with the Webster Moderator System. The management also credits the new system with a marked increase in tenant comfort and a substantial drop in maintenance cost.

Westinghouse Building, Philadelphia

WESTINGHOUSE BUILDING REDUCES HEATING COST

Webster Moderator System Gives Complete Satisfaction, Saves $1,161 in First Year

REDUCTION EXCEEDS ESTIMATE

Philadelphia—The Westinghouse Electric & Manufacturing Company saved more than $1,100 during the 1934-35 heating season by using the Webster Moderator System to control steam distribution in their large Philadelphia building.

The average annual heating cost before modernization, including cost of fuel, labor and maintenance of equipment, was $7,360. During the past season, the total cost was $6,198.38, representing a cash saving of $1,161.62.

The modernization program was undertaken on the basis of an anticipated heating cost reduction of only $693, annually. Commenting on this additional saving and the first year's service with the Webster Moderator System, M. H. Jones, of the Westinghouse Co., said:

"It is very gratifying to me to find that our steam costs under the new arrangement are lower than anticipated. I am convinced that we made no mistake. We feel that most of the credit for the success was due to the efficient operation of your control system."

The Webster Moderator System has provided complete satisfaction and, according to Mr. Jones, should show an increasing economy as the maintenance department becomes more familiar with its operation.

In the Westinghouse Building, three floors are devoted to office space, three floors to service space and the remainder of the building is used for storage. To prevent steam from passing into radiators in the storage section, where heat is not required, solid plates were placed in the radiators. Installed direct radiation now in use totals 26,300 square feet.

The installation was made by Bowers Brothers Co., Philadelphia heating contractors.

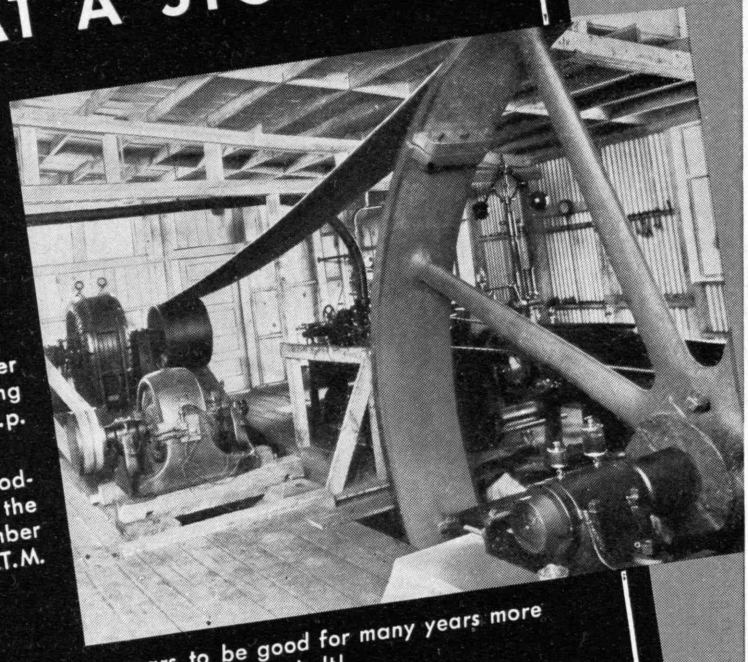
If you are interested in (1) improved heating service and (2) lower heating cost in your building, address

WARREN WEBSTER & COMPANY, Camden, N. J.

Pioneers of the Vacuum System of Steam Heating
Branches in 60 principal U.S. Cities • • Established 1888

IT DOESN'T LOOK LIKE MUCH ...BUT WHAT A STORY!

especially worth remembering if you buy belting



There is nothing unusual about the power plant pictured here—except the amazing story of the belt running from the 250 h.p. Corliss steam engine to the generator.

Twelve years ago this 34" x 9-ply Goodyear Transmission Belt was installed in the power house of a North Carolina lumber company on the specification of the G.T.M. —Goodyear Technical Man.

Unscathed by fire

For eleven years—a record in itself—it performed faultlessly in this strenuous service. Then, a little over a year ago the mill burned down, but the belt was salvaged.

It was next sold to Claude S. Kinsland, a manufacturer of hardwood lumber, for use in one of his Carolina mills. To fit his service, the belt had to be cut down to 20" width, and it went back to work a year ago on this generator drive.

"Good for many years more"

You wouldn't expect much of a belt after going through these vicissitudes of time, fire and alteration, yet Mr. Kinsland recently reported:

"This belt is giving entire satisfaction and appears to be good for many years more service!" What a belt!

See the GTM

You can expect longer service from Goodyear Transmission, Conveyor and Elevator Belting under most difficult conditions—because all are time-proved products of the world's leading rubber manufacturer—and are individually specified to their job after careful analysis by the G.T.M.

Let this practical belting expert give you the benefit of his long experience in reducing costs when you next buy belting. To bring him, write Goodyear, Akron, Ohio, or Los Angeles, California—or phone the nearest Goodyear Mechanical Rubber Goods Distributor.

THE GREATEST NAME IN RUBBER

GOODYEAR

BELTS
MOLDED GOODS
HOSE
PACKING

MADE BY THE MAKERS OF GOODYEAR TIRES

Iron Works, Corby, England

F. S. Lincoln, '22

THE TECHNOLOGY REVIEW

Title Reg. U. S. Pat. Office

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THE COVER

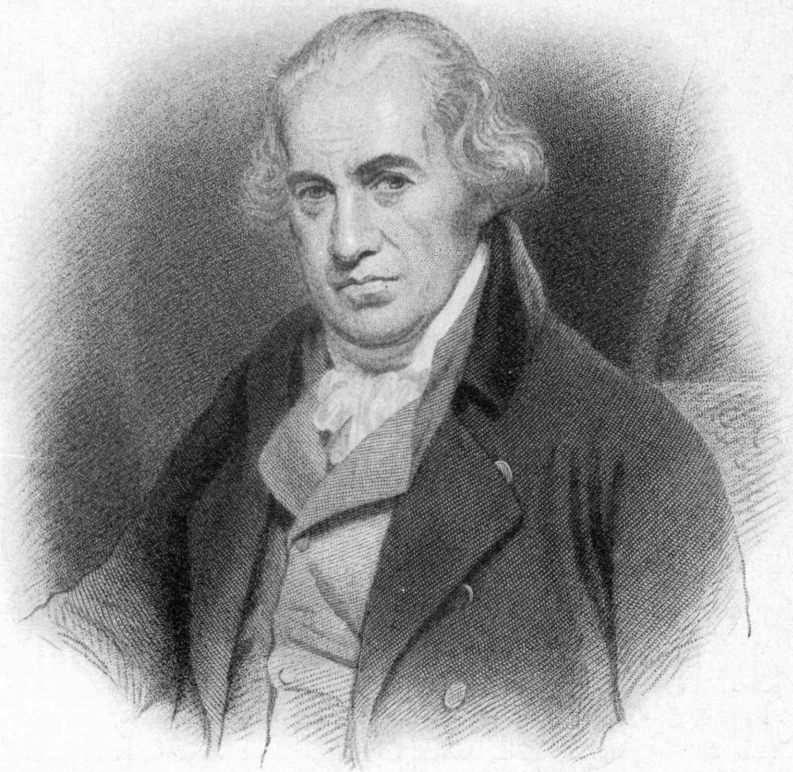
From a photograph by Lewis P. Tabor

PUBLISHED MONTHLY FROM OCTOBER TO MAY INCLUSIVE AND IN JULY ON THE TWENTY-SEVENTH OF THE MONTH PRECEDING THE DATE OF ISSUE AT 50 CENTS A COPY. ANNUAL SUBSCRIPTION $3.50; CANADIAN AND FOREIGN SUBSCRIPTION $4.00. PUBLISHED FOR THE ALUMNI ASSOCIATION OF THE M. I. T. EDWARD L. MORELAND, PRESIDENT; MARSHALL B. DALTON, C. A. SAWYER, JR., VICE-PRESIDENTS; CHARLES E. LOCKE, SECRETARY; J. RHYNE KILLIAN, JR., TREASURER.

PUBLISHED AT THE RUMFORD PRESS, 10 FERRY STREET, CONCORD N. H. EDITORIAL OFFICE, ROOM 11-203, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE A, MASS. ENTERED AS SECOND-CLASS MAIL MATTER AT THE POST OFFICE AT CONCORD, N. H. THREE WEEKS MUST BE ALLOWED TO EFFECT CHANGES OF ADDRESS. BOTH OLD AND NEW ADDRESSES SHOULD BE GIVEN.

James Watt

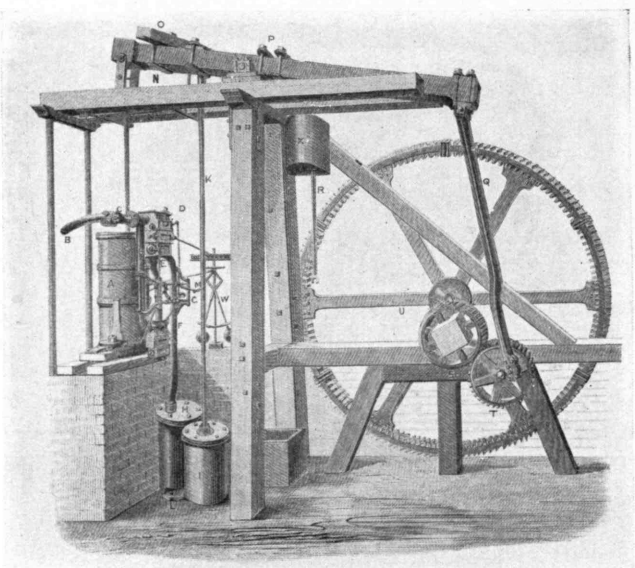
The Inventor of the Modern Condensing Steam Engine, and Creator of the Science of Mechanical Engineering, Whose Bicentenary Was Celebrated Last Month



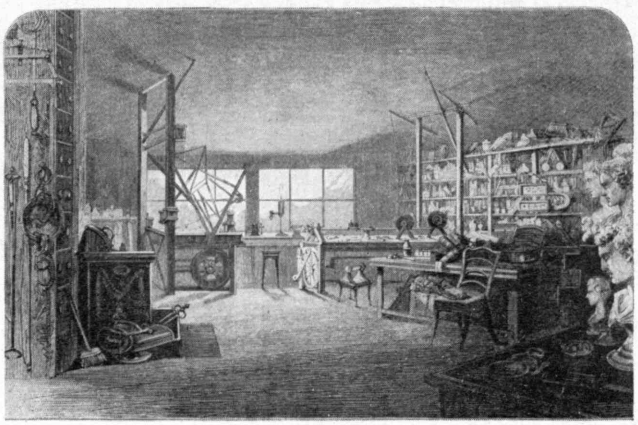
Reproduced from engravings in Smiles: "Lives of Boulton and Watt"

". . . I look upon him, considering both the magnitude and the universality of his genius, as perhaps the most extraordinary man that this country ever produced: He never sought display, but was content to work in that quietness and humility, both of spirit and of outward circumstances, in which alone all that is truly great and good was ever done." — William Wordsworth.

Along with many institutions in England and America, M.I.T. held bicentenary exercises on January 20. With Franklin A. Park, '95, presiding, addresses were delivered by President Karl T. Compton, Dr. William F. Durand, and Professor James R. Jack.



Left. *"Old Bess," an engine built by Watt in 1778 or 1779 (he invented his steam engine in 1765 and patented it in 1769), and one of the first to transform reciprocating motion into rotary motion.* Below. *Watt's garret at Heathfield which was his laboratory during the later period of his life, and which is now reassembled in the Science Museum, London*



THE
TECHNOLOGY REVIEW

Vol. 38, No. 5 February, 1936

The Trend of Affairs

Oil's Origin

LONG before petroleum became of economic importance, the question of its origin was hotly debated by chemists and geologists. The first theory to be considered seriously postulated the formation of metallic carbides while the earth was still fluid. These were supposed to remain as such while the igneous rocks solidified; later, sea water seeped down to them through fissures and reacted to produce hydrocarbons and metallic oxides. The manufacture of acetylene gas from calcium carbide is exactly this process; acetylene can be polymerized to petroleum-like products. Although, with small variations, the foregoing theory may well account for the origin of volcanoes, it is inadequate as an explanation of natural petroleum: first, because petroleum contains optically active compounds of a type never produced by inorganic reactions; second, because animal and vegetable residues are often found in it.

Fantastic elaborations of such theories have been proposed: One writer would have a volcano burst out under the sea, the gases or liquids evolved kill all the fish in the vicinity, and the dead fish fall into the hole, to be covered and converted to petroleum by heat and pressure. Practically minded people have distilled fish at high temperatures and pressures and have obtained petroleum-like products. It has generally been assumed that heat and pressure have been essential for such reactions. Until recently, it has generally been assumed also that petroleum, if of organic origin, must have come from the fatty constituents of animals or plants, since the hydrocarbons of petroleum stand in closer structural relation to the fats than to any other constituents of organisms.

At the Organic Chemistry Symposium of the American Chemical Society recently held at Rochester, N. Y., Dr. Benjamin T. Brooks discussed new and important material on the origin of petroleum. He pointed out that the temperature of the deepest wells rarely exceeds 150 degrees F. and that the hydrostatic pressures in the oil beds are less than those employed in some commercial chemical syntheses. Oil deposits are estimated to be 150,000,000 or more years old — perhaps even such a complex reaction as the production of petroleum from green plants could occur at moderate temperatures and pressures, when given such a long time!

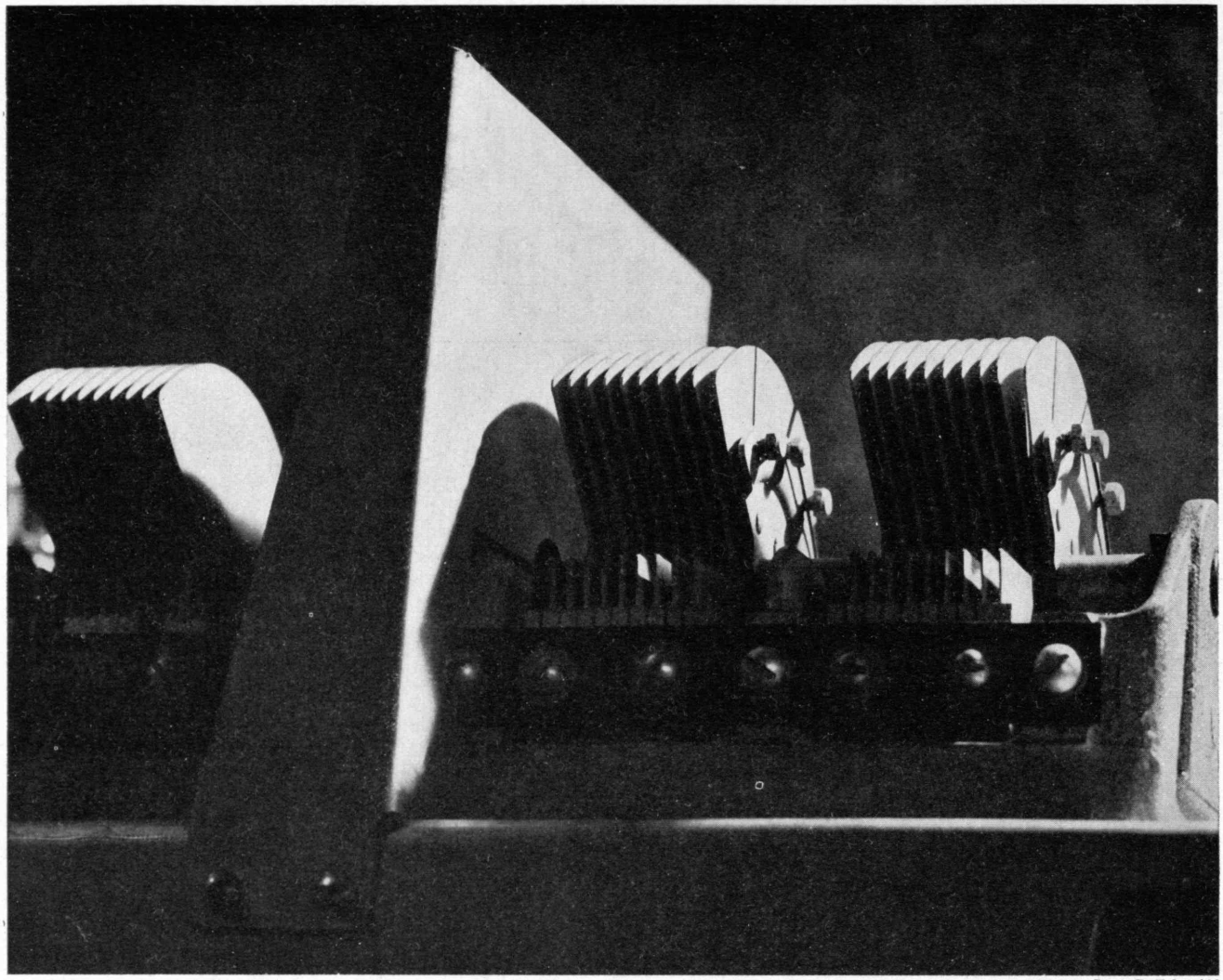
Recently, colored compounds known as porphyrins, closely related to chlorophyll (the green coloring matter of leaves), have been isolated from petroleum. This proves that petroleum is at least partly of plant origin; further, since porphyrins are very easily decomposed by heat it is improbable that petroleum has been hotter than 400 degrees F. at any state of its history.

Dr. Brooks discussed also the question of further spontaneous changes in the nature of petroleum under its present conditions of temperature and pressure — that is to say, whether or not the constituents of petroleum are in chemical equilibrium. From consideration of the absence of free hydrogen in petroleum and natural gas and from the relative amounts of aromatic hydrocarbons at different depths, Dr. Brooks concluded that petroleum is not an equilibrium mixture.

OTHER views, discussions, and conclusions noted by The Review observer at the Organic Symposium:

¶ Professor Marston F. Bogert of Columbia pointed out that the pigments of flowers and vegetables, vitamin A, and isoprene (the structural unit of natural rubber) are structurally related.

¶ Professor L. F. Fieser of Harvard reported relationships between morphine, the toad poisons, saponins, and hydrocarbons having a tendency to produce cancer, on the basis of the phenanthrene unit.



Lewis P. Tabor, '22

Capacitance. The photographer discovers beauty within a radio set

¶ Professor Vincent du Vigneaud outlined the present status of vitamin and hormone chemistry in an exceptionally clear and interesting manner. It appears possible that powerful preparations of hormones, capable of controlling almost completely the rate and extent of development of adult characteristics and sexual activity of men and animals, may be obtained synthetically, starting from wool fat. The possible effect on our economic and social structure of the large-scale production of such drugs is the subject of much speculation by chemists.

¶ Professor Lydon F. Small advanced the interesting point that the alkaloids, so useful in medicine (quinine, for example), are unwanted by-products of the plants which grow them and are, for that reason, stored away in the bark or husks as quickly as possible. Dr. Small went on to show that some of the simpler alkaloids could be synthesized from very simple compounds in the laboratory under conditions sufficiently mild as to be possible in living plants.

¶ President Conant, Harvard — introduced as "Dr. Conant, a member of the Division of Organic Chemistry in good standing" — discussed experimental work on the heats of hydrogenation of unsaturated hydrocarbons, done in collaboration with Professor Kistiakowsky. Dr. Conant demonstrated in a very clear and convincing manner the great utility of thermochemical principles.

Extrapolating Existence

MATERIALISTS and vitalists, alike, probably will find in the virus protein, which Dr. W. M. Stanley of the Rockefeller Institute described to the American Association for the Advancement of Science in St. Louis last month, argument for their respective theories about the origin of life. Alive and, yet, not alive according to usual criteria, the protein which was extracted from tobacco virus is merely a minute crystal; yet it reproduces itself, and, what is more important, it causes disease in plants exactly as does the mosaic virus. Seemingly, it may be a link between living and nonliving matter and, as such, may be of pronounced philosophical significance, in so far as it may be used to substantiate the theories of those who believe that life can be produced independently of antecedent life.

These abiogenists will see in it possible substantiation for the assumed origin of living matter through molecular combinations under fortuitously satisfactory condi-

tions in some far removed geological period, or they may use it to force vitalists to push back still farther in time the supposed arrival of life on this planet.

Unfortunately for controversialists who seek tangible evidence, filtering discloses that in size the virus protein is less than a molecule of albumen. Its virulent activity is stopped, as living things are killed, by excess of acidity or of alkalinity. It is digested by pepsin. It is killed or terminated by a temperature of 201 degrees F. Recrystallized again and again, it preserves physical, chemical, and biological properties unchanged. On this last score, it appears to be an inanimate chemical compound. The question which Dr. Stanley hopes to answer next is whether virus activity is also a property of the protein molecule and not necessarily only of a living thing. Vitalists will be slow to concede without clear evidence that activity, even so malign and apparently nonvolitional as that of a virus, can be an attribute of nonliving matter.

The limits of life had been extended in the other direction, theoretically at least, earlier in the month by Dr. Alexis Carrel. In a lay address at the New York Academy of Medicine, the biologist who has kept a chicken heart alive for 24 years at the Rockefeller Institute linked the following: revivification of dessicated animals such as the arthropods, *Tardigrada;* improvement of rejunevating medical technique through such apparatus as the artificial heart and lung invented by Colonel Charles A. Lindbergh; analysis of the conditions responsible for the aging of tissues; search for the physiological factors which determine longevity. Through these four means, he held that death may be deferred; it cannot be conquered.

The remote possibility of placing men in storage for long periods of time, with animation suspended, and of bringing them back to normal existence at intervals offers interesting speculation to the social historian. If the retentiveness of memory were maintained during the intervals of storage and if individuals of keen mental powers were selected for this partial immortality, useful criticism of stages of culture in the light of the remote past might be had from them — not to speak of the solving of historic enigmas. It does not require the imagination of a Wells to conceive the popular excitement in the world state of 2436 A.D., when, through television and brain-wave radio transmission, the recollections of the man who has been asleep since 2136 A.D. are transmitted from Swakopmund throughout civilization.

Future developments from the findings of Dr. Stanley and Dr. Carrel may offer the implementation for man's aiding the process of his own evolution, thus providing an answer to a problem which man should consider, as Dr. John C. Merriam told the Association in St. Louis.

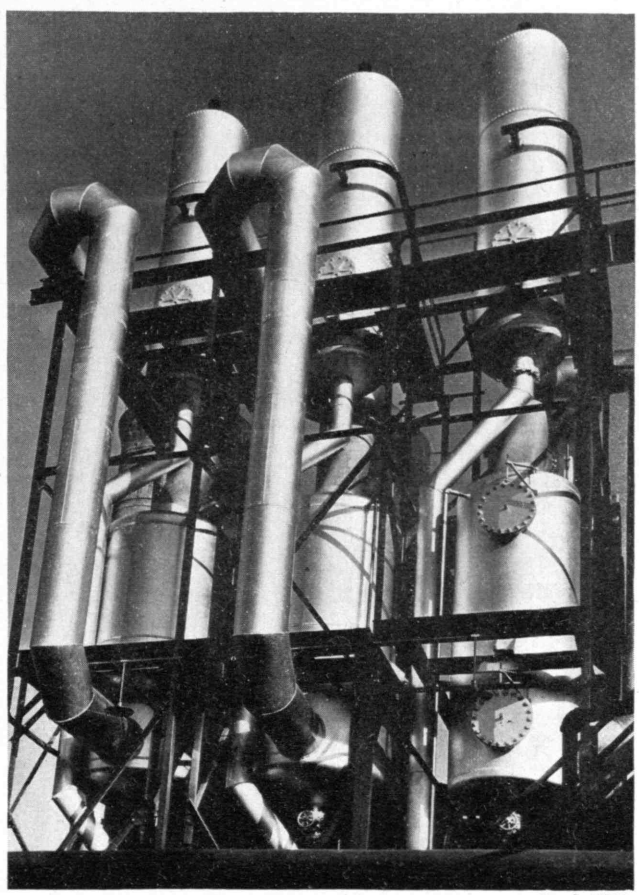
Help for Narcoleptics — and Professors

'Tis the voice of the sluggard, I hear him complain;
"You've waked me too soon, I must slumber again."
— Isaac Watts

TO professors whose students fall asleep in class, the now prevailing medical opinion is very consoling: The fault is not with the lectures, but with the central nervous systems of the students. The students are suffering, not from boredom, but from narcolepsy. They have an ailment which makes them subject to fits of drowsiness. The ailment ought not to be treated by the various psychological tricks which have been well known to professors, rhetoricians, politicians, and others from time immemorial, for it is not psychological; it is physiological and can be rectified by means of medicine.

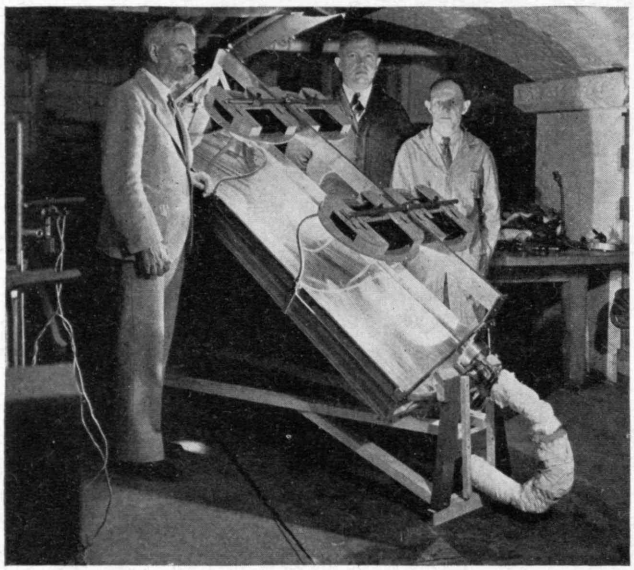
A recent paper in the *Journal* of the American Medical Association reports experiments on a new synthetic drug, benzedrine, which have been carried out at the Boston City Hospital and the Harvard Medical School. The new drug has been found, in nine cases, to give complete relief to persons who fell asleep at least three times a day. Seven of the cases were students, one was a housewife, and one an office worker. One of the students was a girl who had had to give up her attendance at college because she couldn't prevent herself from falling asleep in class. Three of the students, like giggling schoolgirls, suffered from a momentary generalized weakness whenever they laughed. The circumstance must have given their professors an entirely false notion of the efficacy of professorial humor. However, benzedrine has cured the students, and the professors, we hope, are wiser, in consequence.

Benzedrine has been found to be about three times as effective in preventing attacks of sleep as ephedrine which, heretofore, has been used for this purpose. It also gives a virtually complete relief from cataplexy, which is a state of muscular rigidity produced by sudden shock or fear.



Bourke-White

Distillation. The architecture of the chemical engineer



New solar heater, designed by Charles G. Abbot, '94 (left), Secretary of the Smithsonian Institution, and described as "the most efficient apparatus so far developed by man for the direct conversion of the rays of the sun into useful mechanical energy"

Benzedrine is a derivative of ephedrine; specifically, it is racemic desoxy-nor-ephedrine. By making slight changes in the molecule of ephedrine, chemists have been able to alter and improve its pharmacological properties. Ephedrine is also an interesting drug. Although it has been used for only a few years in occidental medicine, it has already established a definite place for itself. In general, it has the same effect as adrenaline, which has to be injected hypodermically, but ephedrine has the advantage that it may be taken through the mouth. It is useful for asthma and hay fever. The plant which contains the drug has, for centuries, been included in the *materia medica* of the Chinese, who were well aware of its applications and usefulness. Chemists, seeing that the Chinese plant had real medicinal value, isolated the active principle from it, determined the arrangement of the atoms within its molecule, and developed methods of synthesizing it from cheaper and more abundant materials. Synthetic ephedrine is now on the American market, as is benzedrine, a drug which is not known to occur in nature and is better than ephedrine in certain respects.

Science on Display

EARLY this year, with a roll of news drums and a considerable scientific fanfare, the New York Museum of Science and Industry will throw open the doors of its new home in the Forum of Rockefeller Center. The event will mark the coming of age of this important adjunct to New York life and, incidentally, will at last provide a use for a space that has been plaguing the management of the Center.

The Forum, designed originally as a tiered restaurant with a central well for night-club-like performances, has never seen a floor show, for it was found that the tiers were so arranged that no table sitter could view the show. Hence, except for a sporadic exhibition or two, the Forum has remained a mausoleum of embalmed hopes for whoopee in Rockefeller Center. Where the Trixie Friganzas of a new age were to have tripped it lightly, a full-size model of the *DeWitt Clinton* will huff and chuff; walls that were to have echoed to the pop of champagne corks will reflect, instead, the crackling discharges of Leyden jars; decorations that might have consisted of aluminum foil and glass will consist, instead, of sections of cams, gears, and bearings.

Ideally situated for such a museum, the new space is also ideally laid out. Convenient stairs lead comfortably from tier to tier, and the tiers themselves are well arranged to permit an orderly display of the material now in the collection. Moreover, a very good mezzanine will permit adequate presentation of a new feature of museum policy — the housing of temporary exhibitions contributed by industries which are "sold" on science — calculated to bring to the nonvoyaging New Yorker an appreciation of the fact that things are happening in Schenectady, Akron, Pittsburgh, Madison, Detroit, Rochester, and other outlandish points.

The first of these exhibitions, concomitant with the opening, will be based on the things seen on the recent tour of laboratories run by the National Research Council (see The Review for December, 1935, page 90). Others now being planned will deal with shelter, transportation, and communication. It is hoped, on this mezzanine, to keep the public currently informed, while the rest of the museum will educate those uninitiated in the past of the industries and the sciences.

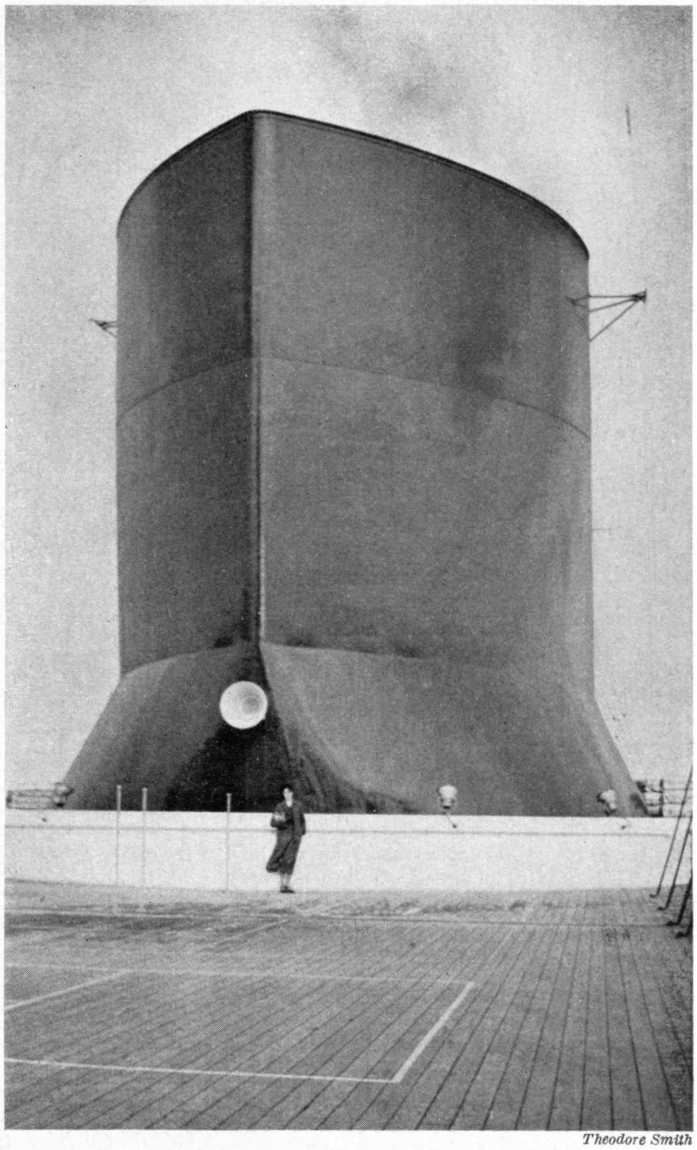
Although overshadowed somewhat in the public eye by the larger museums of the Franklin Institute in Philadelphia, opened in 1934 as a result largely of public

Walter S. Meyers

"In the Web" — a photograph from Brooklyn Bridge

subscription, and the Julius Rosenwald in Chicago, occupying the reconstructed Fine Arts Building of World's Fair fame, the New York Museum is the oldest, planned science museum of full scope in this country. There are, of course, other older collections, including those of the Smithsonian Institution and of the Bell Telephone Company.

The New York Museum has had a somewhat unsteady history. It was first suggested in 1912 at a meeting of the American Association of Museums. In 1914 it was incorporated under the name of the Museum of the Peaceful Arts — the incorporators including such men as Schiff, Tesla, Gary, Towne, Edison, Vail, Peary, and Huntington. In 1924, Henry R. Towne, the lock manufacturer, left a considerable bequest contingent upon the establishment of a satisfactory institution. This resulted in a trip to Europe for Charles T. Gwynne, during which moving pictures were taken in the four principal foreign museums. These pictures and the Gwynne report have served as the bible of all the industrial museums here. In 1926, the Museum took demonstration space in the *Scientific American* Building and, from 1927 to 1929, spent its funds in the acquisition of exhibits and the creation of a favorable public opinion. By 1930, larger quarters were required and the present name was adopted as the Museum moved to the Daily News building. Here, in one twelfth the space of the famed Deutsches Museum, the New York show entertained 55% as many visitors as that organization in the year 1932 to 1933. Meanwhile, with increasing interest and despite liberal donations by the Carnegie Corporation and the New York Foundation, funds were running low, and in 1933 the trustees had to report that there was money enough for only one more year. At the same time, a more central location appealing to a better class of visitors was sadly needed. Today, with more money and with a new board of trustees which includes Frank B. Jewett, '03, as President, and Gerard Swope, '95, the Museum seems to be on the march.



Theodore Smith

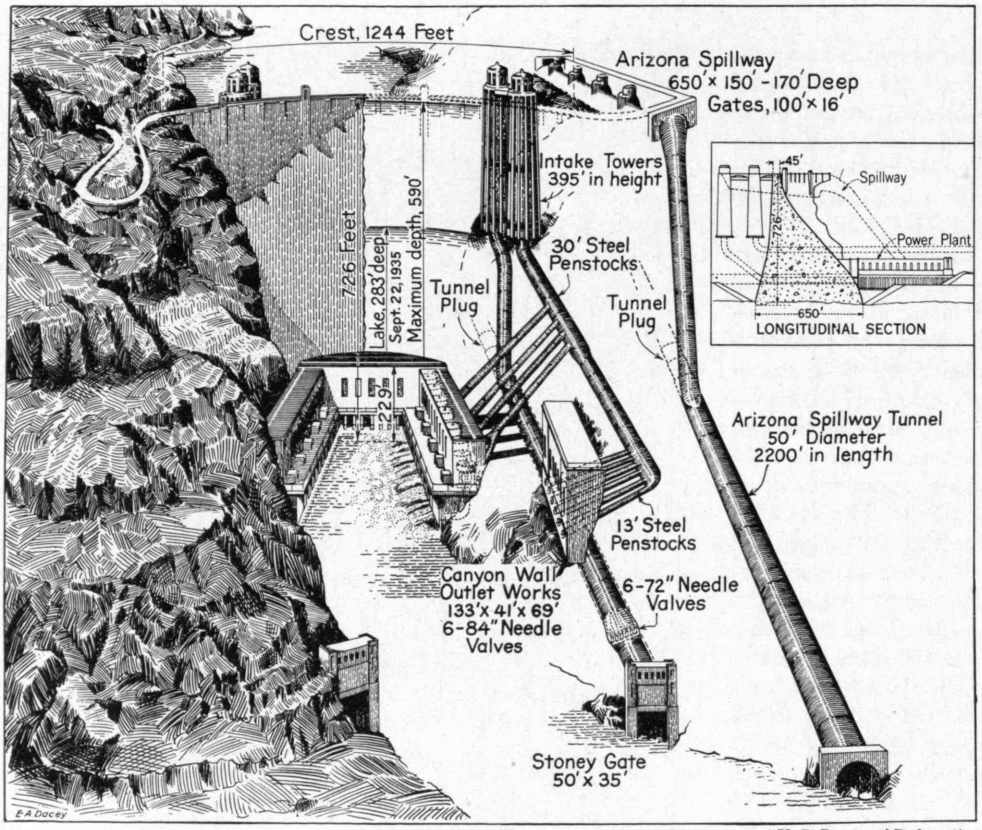
Scale — one of the streamline funnels of the Normandie

All this while, the Museum has had at its disposal the offer from the city of a considerable plot of land in Jerome Park for a new building. However, in some contrast to the policies of the Philadelphia and Chicago museums, the New York directors have held it better first to have a museum and only secondly to have a building.

The idea of the science museum is still in its infancy here. In Europe, of course, it is very old. The Musée des Arts et Metiers in Paris really began in 1782, when de Vaucanson left his tools to such a museum, and was actively prosecuted when Descartes became interested in 1799. Today a stuffy set of medieval buildings house, in no very brilliant style, a large and often exciting collection, including original Jacquard looms, original apparatus from the laboratory of Lavoisier, original work by Daguerre. This museum is planned for those who know something about what they are studying. It has amphitheaters for lectures and tracks to carry material to these amphitheaters. Very little explanatory material exists for the casual passer-by. Americans who have rather generally criticized this exhibition are prone to forget that French museums in general are planned for the intelligentsia; they forget that the Carnavalet, for example, would not be very exciting to one who had not already been excited by French history.

Next chronologically in Europe is the Science Museum in South Kensington, London, built, like the Rosenwald, on the exhibits from an exposition — in this case that of the Crystal Palace. Opened in 1857, it occupied a new building in 1924. The exhibitions here are better for the casual visitor than those at Paris, as they are well placarded and many are capable of motion. Moreover, the collection of originals is noteworthy, including materials from Watt, Arkwright, Stephenson, Maudsley, Bessemer, and scientists such as Babbage, Herschel, and Kelvin.

It is in the Deutsches Museum at Munich, however, that Americans have found their principal stimulus. This museum, the greatest of its kind in the world, is the work of one man, Dr. Oskar Von Miller, who proposed the original plan in 1903, lived to round out the collection,



U. S. Bureau of Reclamation

Boulder Dam and its appurtenant works. An explanatory drawing with the Arizona wall cut away to reveal the intake towers, spillway, penstock pipe, and outlet works

the erection of a reinforced concrete group of buildings on the Isar in 1913, the move to the new buildings after the War, in 1922, and the formal opening on May 6, 1925, celebrating his 80th birthday.

The Deutsches Museum is not only large; it is built on a different thesis from those of Paris or London — the thesis that the masses need education in the processes by which they are able to live today, and that this education must start with primitive efforts in a given field and carry through the salient steps, and only those, down to date. Realism, dioramas, color, sound, motion, are employed to the fullest. (The richest American demonstration of the last-mentioned phases of the technique was given in the Hall of Science of the Century of Progress.) Dr. Miller was a unique collector: With equal ease, he wangled a $50,000 steamship model from the Kaiser and a planetarium from the Zeiss Company. Moreover, he kept himself untrammeled and accepted no restrictions on the collection. Thus, while Paris has had to keep and exhibit every donation, thereby accumulating a considerable amount of junk, Munich is free to edit. The editing has, however, not been quite so free as is needed for a truly popular museum, largely because of the Teutonic enthusiasm of a group of specialists who have arranged the collection. The Munich museum tends to be a little bewildering. From this point of view, the simpler and new Technische Museum of Vienna, opened in 1918, is an improvement.

In America, the Miller influence has been widely reflected through Dr. Charles R. Richards, '85, who has been the outstanding American authority. Departures from the Miller technique in this country are largely in the greater emphasis on complicated modern improvements — at some loss to the teaching of fundamentals. This, however, is not Dr. Richards' fault.

The chief problems confronting all American museums are those raised by corporations and children. The corporations must, in the last analysis, supply all the materials, and few have the prescience to realize that the best publicity is the least obtrusive. Sales departments have their say, and it has been very hard for the museums to keep their shelves free from specific demonstrations closely keyed to individual companies. Children offer difficulties because they are too young to understand many of the demonstrations but are so thrilled by motion that they are likely to be in the way.

Mass education is such a fetish in America that it is natural that the museums should follow this same principle. For this purpose, originals are unnecessary, perhaps even undesirable as being too valuable. Moreover, there is a vast accumulation of material too special in interest to have a place in a museum which sets out to educate those ignorant of the whole field of science and industry. There is, therefore, room for another more technical type of museum to whose quiet halls the studious might repair for study or even for intellectual repose. There is little use in letting educationally unwashed hands paw over the original *Rocket*. Yet, the student of transportation might feel a religious awe in the presence of the original that no reproduction could create synthetically.

In this connection it is interesting to note that the original charter of Technology provided for the establishment of a museum in conjunction with the Institute. It was recently decided to use the more than two-and-one-half miles of corridors in the Technology buildings as exhibition space for the Institute's collection of historic apparatus, models of important engineering structures, and new scientific devices. Splendid displays of economic minerals and of ceramic products are now completed, and others will be added as funds and time permit. The Institute's Naval Museum is steadily growing, both in fame and size. Taken together, these exhibits will provide for Metropolitan Boston a science museum designedly less theatrical than many of the larger museums, devoted to the technically discerning.

The more popular museums, however, have an important place in the national life. Chicago, Philadelphia, New York might well have collections of general interest; Pittsburgh and Detroit, of more special interest. To the New York Museum of Science and Industry, The Review wishes a pleasant housewarming and a long and successful occupancy of its place in Manhattan life.

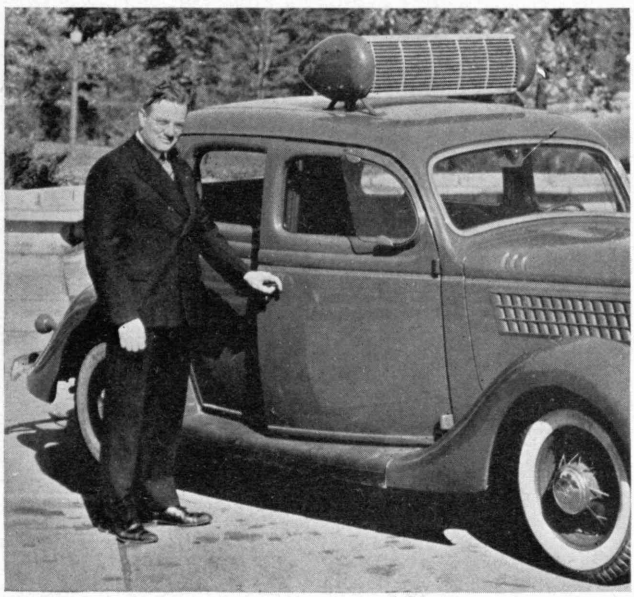
Wooziness

NOW that passenger transport planes are flying regularly at altitudes up to 12,000 feet, where the air resistance permits high speeds and a marked saving of fuel, the need for information on the physiological effects of reduced atmospheric pressure and oxygen content of the air becomes a matter of immediate importance. While there is considerable medical information on the effects of pressure in general, very little research has been done on the physiological consequences of altitude flying.

Aside from nausea, headaches, prostration, and irritability, which are apparent in varying degrees in persons sensitive to reduced pressure and low oxygen supply, it is known that the spleen reacts immediately with a contraction which forces more of its blood cells into the blood stream to assist in carrying the reduced supply of oxygen to the body tisses. Only a few of the thousands of passengers traveling at high altitudes appear to feel any ill effects. Sensitive individuals, however, may experience earaches and a disturbance of the sinuses.

At 16,000 feet, an altitude reached daily by the meteorological observation planes in various parts of the country, the air pressure is approximately 50% less than at sea level. At this height many pilots find it necessary to resort to their oxygen, although a few experience no great discomfort. However, any effort, mental or physical, is likely to produce distress: Routine movements in operating a plane become extremely exhausting, reaction times increase, and even the mental effort exerted in looking at an instrument or in making simple calculations or decisions becomes painful. These effects are definitely related to oxygen deficiency, and alertness is restored by enrichment of the air supply. The first signs of this condition, generally described by pilots as "wooziness," is extreme lethargy and inability to concentrate on normal tasks.

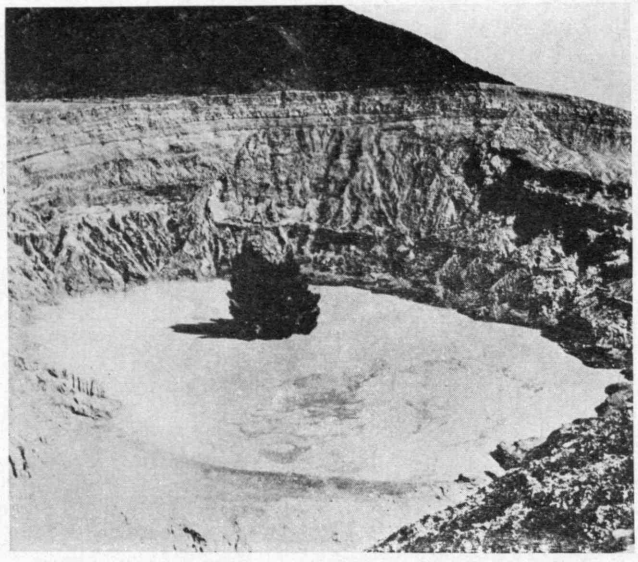
The camera captures, in a searchlight, the reflection of a motion-picture set (the searchlight is shown upside down, of course)

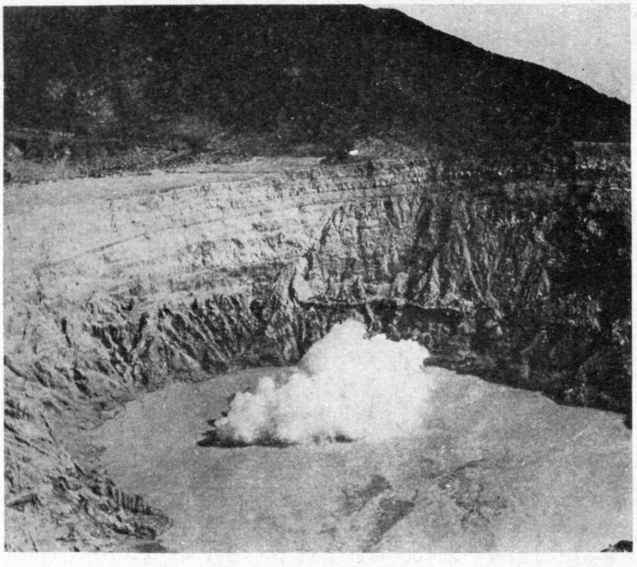


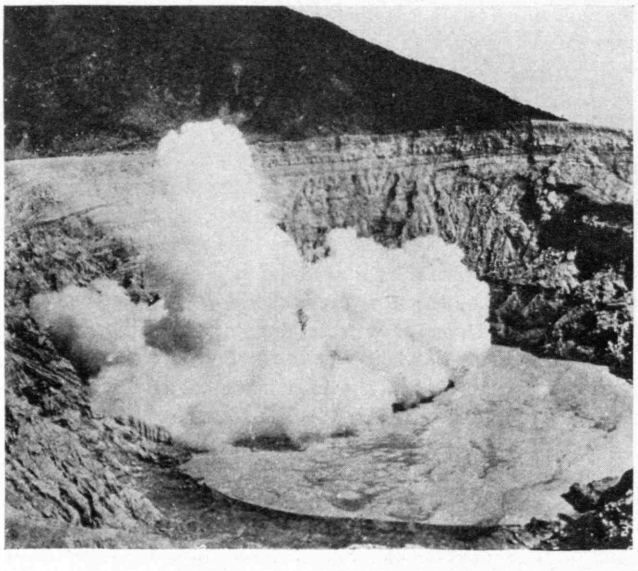
Ralph F. Peo, Vice-President of the Houde Engineering Corporation, and his Houdaille-Carrier air-conditioned automobile after a 12,000-mile test run. Complete year-round air conditioning is now available for busses, and it can be applied to taxicabs and private cars

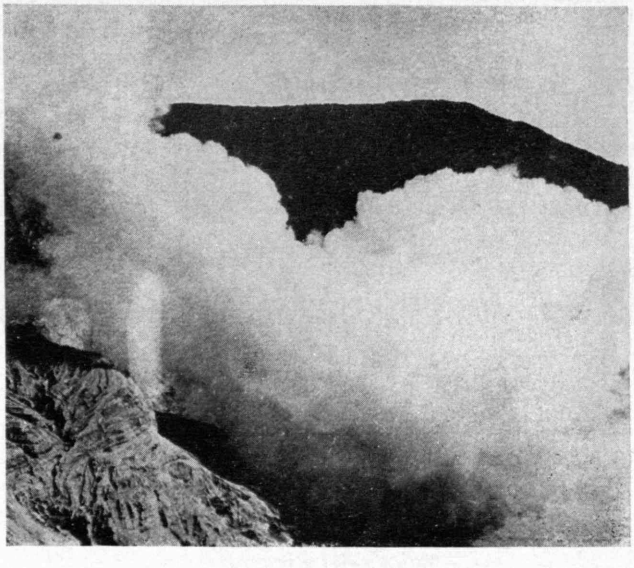
The effects of pressure changes on the body may be far more complex than is realized in the light of present knowledge. In deep-sea diving, for instance, a rapid decrease in pressure, which causes what is known as the bends or caisson disease, is very dangerous. This condition is due to the fact that under the influence of increased pressure, nitrogen passes from the blood stream into the tissues. Time must be allowed for the dissipation of this nitrogen or the results are serious. For this reason, divers working at depths of 50 feet or more must ascend to the surface very slowly, stopping frequently to give the body time to readjust itself to the gradually decreasing pressure. The ascent from a depth of 100 feet may require as much as an hour.

While the diver goes from normal atmospheric pressure to pressures far greater than the body is ordinarily called upon to stand, the flyer reverses the process by going from normal to reduced pressures. It would be interesting to know what effect, if any, the rapid changes in pressure encountered in flight have on pilots and passengers — whether the swift descent from rarefied atmosphere to normal produces changes of which we are not yet aware. The diver adjusts himself very









slowly to pressure changes, whereas the flyer may descend thousands of feet from low to normal pressure in a few minutes.

Experience indicates that duration of exposure to rarefied atmosphere and low oxygen content may be an extremely important factor in physiological effect. During the World War officers of the German Zeppelins, which cruised at high altitudes and remained in hiding above the clouds for many hours at a time, reported that after a considerable period under such conditions the crews, long accustomed to flying, began to suffer considerable discomfort. Pilots remaining at high altitudes for a long time experienced the same effects. It seems highly desirable, therefore, that this important aspect of the problem be thoroughly investigated.

Professor Yandell Henderson of Yale University, an authority on asphyxia, suggests that the physiological effects of altitudes higher than 10,000 feet should be investigated. His own studies of the effects of pressure changes on the human body show that there is a wide variation in individual toleration of oxygen deficiency. Whether pilots flying regularly at high altitudes will gradually develop a tolerance, which many appear to do, remains a question to be answered by careful study.

Although the average person apparently feels no discomfort in flight up to 12,000 feet, Dr. Henderson suggests that, from that altitude upward to 20,000 feet, oxygen might be necessary as a precautionary measure. For passenger flights above (*Concluded on page 200*)

WHEN POAS LET GO

Despite quakings beneath him and rumblings in the air about him, Edward T. Owens, engineer of Jacksonville, Fla., outstayed his guide and companions to catch these views of the 1916 eruption of a Costa Rican volcano. The crater is at an altitude of 8,895 feet and is usually covered by clouds, except for a few minutes now and then in the early morning. The sulphureous, green lake is perhaps 900 feet below the rim and is approximately a mile in diameter.

The four pictures were taken about four seconds apart. Mr. Owens estimates that the lava and steam in the first had risen to 200 feet above the lake; in the second, to 500 feet; in the third, to 1,000 feet; in the fourth, possibly to 2,000 feet. Although taken 20 years ago, these rare pictures are now reproduced for the first time

Philosophers' Stone: 1936 Model

Which Might Also Be Called The Alkahest

By Philip M. Morse

IN the delightful little book entitled "Alchemy," written by the Rev. J. E. Mercer, sometime Bishop of Tasmania, we find the following excerpt:

Van Helmont's belief in the discovery of the Universal Solvent, called by Paracelus the Alkahest, affords another striking instance of over-credulity. . . . There is no telling how long the Alkahest might not have maintained its reputation, had not a critic pointed out the simple reflection that if the solvent really existed, it could not be stored or used; for it would dissolve the vessels in which it was contained!

We regret having to consider the Rev. Mercer's attitude as smacking of over-*in*credulity, but during the last five years physicists have discovered a material which, in a sense, *is* the Alkahest. And curiously enough, it has also the properties of the famed Philosophers' Stone! We say this new substance is a universal solvent, *in a sense*, for it does not mix with materials by making them liquid; it simply is able to pass through all materials as air can pass through a sponge. The dilemma expounded above turns out to be, not a proof of the nonexistence of the Alkahest, but a simple statement of the practical difficulties physicists encounter in controlling it.

The material is a gas, of course, since nothing has been found which can compress it to any appreciable density. Only five years ago were molecules of this gas detected; only three years ago did we learn how to produce them in any great quantity. Individual molecules of this curious substance are called neutrons. Stray individuals were detected by Bothe and Becker in 1930. In 1932 Irene Curie and her husband, Frederick Joliot, found out how to produce a few of them. These investigators labeled the particles as unknown radiations, and it was Chadwick, in the same year, who revealed their actual nature. In a paper which reads as though it may become one of the classics of science, he showed that the new radiation consists of particles of mass approximately equal to that of the hydrogen nucleus, but differing from all other atomic nuclei in having no electric charge. For this discovery Chadwick received the 1935 Nobel Prize in physics, and the Curie-Joliots, the Nobel Prize in chemistry. (So *this* is chemistry!)

In the short time since neutrons have been known, their properties and behaviors have been studied intensively by workers of nearly every nationality: The investigators at Cavendish Laboratory have watched individual neutrons play hob with individual nuclei; in 1933, research men at California Institute of Technology discovered methods of producing them in great quantities; Fermi and his associates in Rome showed they would cause transmutations of all varieties of atoms; workers at Columbia University have studied their ability to sneak through solid matter. Every month some new and interesting property is reported; many of the phenomena mentioned in this article have been discovered since last spring.

Neutrons can be produced in many ways. The least complicated source is a piece of beryllium in contact with radium emanation. Beryllium is particularly susceptible to nudges from the alpha-particles given off by the emanation. It absorbs the alpha-particles, breaks down into carbon, giving off neutrons as a by-product. Although the method is quite simple, it is practicable only for producing small quantities of neutrons, as radium emanation is rather hard to get in large quantities. A much more plentiful supply can be obtained by shooting heavy hydrogen atoms at beryllium, with very high velocity. A milliampere current of million-volt, heavy-hydrogen particles falling on beryllium will produce about 10^{12} neutrons per second. Van de Graaff's big six-million volt generator may be able to produce as much as 1,000 times this quantity, or about one microgram of neutron gas an hour.

This seems like an exceedingly small amount of neutron gas for all our efforts, but it is much more than we know what to do with at present, because we have no way of keeping the gas, once we have obtained it. Neutrons, having no electric charge, pay no attention to the cloud of electrons guarding each atom of ordinary matter, and rebound only when they hit the tiny center of the atom, the nucleus. Since the nucleus offers less than one millionth of the obstruction which the cloud of electrons surrounding it does, neutrons are able to slip through matter as solid as iron with no more difficulty than an atom of ordinary matter has in going through a vacuum of one-thousandth atmosphere. Imagine trying to store a gas with nothing less porous than cheesecloth!

As a matter of fact, heavy material is much less efficacious in confining the gas than is very light material, especially one containing many hydrogen atoms. The neutrons, when they are given out by the beryllium, are traveling at a very high rate of speed and must be slowed down before they will consent to stay long in one place. Neutrons bounce off heavy nuclei without loss of energy, but when they strike hydrogen they give up half their energy, on the average. A dozen or so collisions with hydrogen atoms serve to calm them down. The best storage tank which has been devised so far for neutron gas is a small pocket in the center of a very large block of paraffin. The paraffin does not hold the gas in with any marked success; nevertheless, it offers enough resistance to its passage so that a small partial pressure of neutrons, perhaps a billionth of an atmosphere, is built up inside the pocket. Workers at Carnegie Institute of Technology have drilled a hole into such a pocket and have observed a wind of neutron gas

streaming out. They have even measured the velocity and the number of the neutrons in the wind.

Although neutrons can penetrate any substance, we have not been perfectly accurate if we have given the impression that all matter is equally transmissive. Some materials offer a very much greater barrier than others, and this variation in obstructing power seems, at present, to have no rime or reason. For instance, light hydrogen presents nine times the barrier that heavy hydrogen does; cadmium offers 800 times the barrier of tin; gadolinium, 1,000 times the barrier of barium or cerium; mercury, 42 times the barrier of lead. The abnormally large obstructing power of cadmium, gadolinium, and mercury is of no help to us, however, in building a storage tank, for these nuclei do not bounce the neutrons back into the receptacle — they simply swallow them. In fact, they seem to reach out and kidnap neutrons going by at a distance as large as ten or more times the nuclear radius. Cadmium plates with holes in them are used to define beams of neutrons, for few neutrons can get through a thick sheet of cadmium without being swallowed up; but cadmium is a poorer material than paraffin for making storage tanks; it is too greedy.

Nearly any sort of atom can be induced to swallow a neutron once in a while. Since the neutron has no charge, it can sneak up and slip inside a nucleus without being affected by the electric field which keeps other nuclei away. Once having swallowed a neutron, a few atoms (such as cadmium, mercury, light hydrogen, and yttrium) simply digest it, becoming heavier nuclei of the same material. Light hydrogen, for instance, becomes heavy hydrogen. A great majority of nuclei, however, have acute indigestion and break up into nuclei of other chemical elements. This, of course, is transmutation; our modern Alkahest is also the Philosophers' Stone.

Atoms differ considerably in the ease with which they are transmuted by neutrons. Cadmium, gadolinium, and mercury are among the most susceptible, as we have noted previously. At present, with the exception of nickel, investigators have been able to produce transmutations of every element they have tried, and they have tried practically all of them. Why nickel proves so obdurate is not as yet understood.

When nuclei absorb neutrons, they do not transmute immediately, but wait awhile before exploding, as radium nuclei do before they change to radium emanation nuclei. The artificial radioactivity produced by neutrons is not so slow a process as is that of radium or uranium, but it is often slow enough for the induced radioactivity to be measured. The average life of an atom of radio-silver, for instance, is several minutes, and the average life of radio-sodium is nearly a day.

Incidentally, we are just beginning to see the immense importance which radioactive atoms of the common chemical elements can have in science and engineering. They can be used as exceedingly sensitive indicators, for one can detect the presence of only a few atoms of a radioactive substance. To measure the diffusion of chlorine through a steel container one simply mixes a small amount of radio-chlorine with ordinary chlorine, and measures the increase of radioactivity on the outside of the container. If one wishes to follow the circulation of the blood in the human body, one can insert a minute amount of radio-sodium chloride in the blood stream and then measure the radioactivity of different parts of the body. The amount of radio-sodium needed is much too small to do any damage to the body and, in addition, the radioactivity practically disappears in several days. Radium cannot be used for such exploration because it is too expensive to lose, because it is a heavy element which collects in the bones where it cannot easily be removed, and because its radioactivity continues for thousands of years.

You may wonder how investigators can detect such slippery things as neutrons. As a matter of fact, it is possible to count them individually, if they are going fast enough, by amplifying the ionization produced when a neutron breaks a nucleus into pieces. It is also possible to photograph neutron beams in a manner somewhat analogous to the photographing of a beam of light — the induced radioactivity of various materials can be used as a measure of the intensity of the neutron beam which has fallen on the materials. A sheet of silver, for instance, becomes radioactive when neutrons fall upon it, giving up electrons and becoming cadmium. On the average, the silver atom waits several minutes, after absorbing the neutron, before it gives off an electron; so silver can be exposed to a neutron beam and can then be measured for the intensity of its radioactivity. Many other materials can be used as radiographic plates.

The foregoing sketch will perhaps indicate some of the excitement, the bewilderment, and the fun which physicists have been enjoying in research in nuclear physics during the last few years. It is not surprising, in view of the entrancing problems continually presenting themselves and the frequent glimpses of tremendous useful possibilities, that many workers all over the world have taken up the study. Already more than half a dozen men have started research in this line at Technology. When Van de Graaff's great generator at Round Hill is completed, Technology will take its proper place in the forefront of research in nuclear physics.

Wide World

President Compton demonstrates in St. Louis the new radium detector developed by Professor Evans of Technology *(see page 186)*

The Oil-Shed Fallacy

Attacking the Problems of Lubrication by Rational Methods

By Mayo D. Hersey

IT WOULD be a commonplace to say that the latest advances of science and technology are eagerly utilized in every large industrial enterprise, notably in the electrical industries. Most of the technical problems which are recognized as fundamental or recurrent are placed under the direction of professionally qualified men; but not all these problems are customarily so treated, and rarely lubrication.

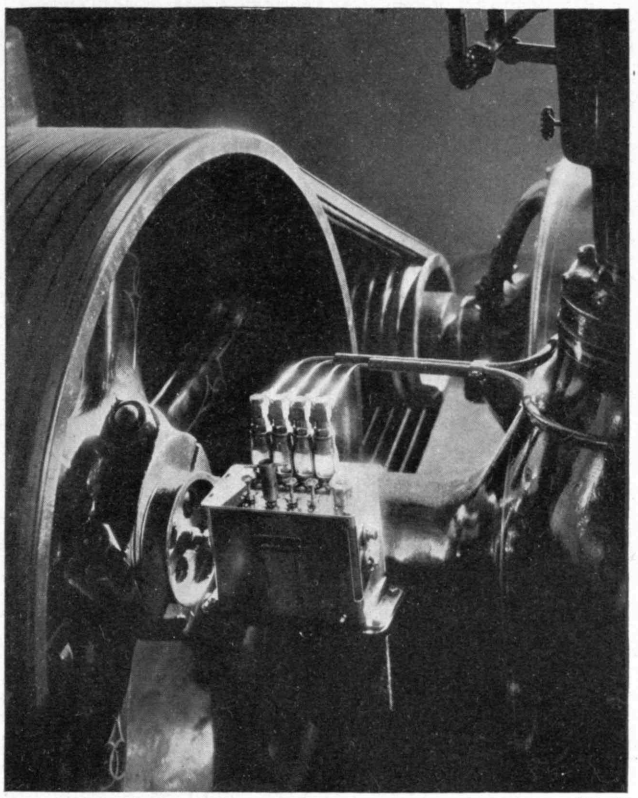
Go to the executives of almost any manufacturing corporation — with a proper introduction — and ask how they are handling their vibration problems, new light-weight alloys, or calculation of electrical constants. In five minutes a number of Ph.D.'s, or electrical and mechanical engineers, will be sitting around the conference table with you.

Inquire about lubrication, however, and the vice-president calls for the chief metallurgist, who doesn't know. "Let's see, now," they ask each other, "who has the key to the oil shed?" After Mike has been sent for and is getting his shirt on, somebody remembers the purchasing agent. But when all has been said and done, it is unanimously agreed that Mike has the only *real dope* in the organization, and that he learned it from the labels on the oil barrels.

Isn't there a fallacy here — a fallacy in the organization chart? Why call upon doctors of science to study the shearing stresses in steel shafting, leaving the shearing stresses in the oil film to the doctors of janitorial service? Why the mahogany conference table for structural analysis and the tin oil shed for lubrication?

Just what is known to date about these shearing stresses in the oil film? How far has our knowledge of the mechanics of lubrication progressed? An attempt was made to answer these questions in a recent series of lectures at the Institute. Certain principles have been established by basic theoretical reasoning, and other facts have been determined by a wide variety of experiments; these principles and facts have been applied with great advantage in the design and operation of machinery.

There remains, nevertheless, a wide gap between the mechanical engineers in each country who are attacking the problems of lubrication by rational methods, and those who work by rule of thumb. In defense of the latter groups, it may be said that many of the problems confronting them each day are more complex than any thus far solved by scientific research methods. We shall consider what might be done to close the gap, after first reviewing some of the principles and facts which have already been discovered and applied in connection with the mechanics of lubrication.



Ruttasse

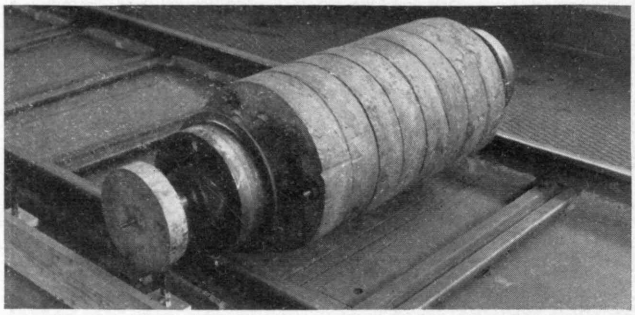
Windage, belt friction, and bearing friction

Measuring the starting friction of a mine car with diaphragm type dynamometer and slow-motion screw

Principle of the Converging Film

Underlying the mechanics of lubrication we find the principle of the oil wedge, or converging film, due to Osborne Reynolds. The lubricant adheres to both the moving and the stationary surface; if the inclination is such that the lubricant is being dragged into a narrower and narrower space, a true fluid pressure is developed. This pressure supports the load, floats the journal or other moving part, and prevents metallic contact. Consequently such inclination is desirable, and the designer must endeavor to provide for it.

The action is in some respects analogous to that of an airplane taking off from the ground. Reynolds' principle, when formulated mathematically, leads to the hydrodynamic theory of lubrication. By means of this theory it is possible to calculate the film thickness, film pressure, and load capacity of a bearing when the conditions are stated in a simple and definite form.



Rolling friction separated from bearing and flange friction. Kinetic tests using rigid lead cylinder of known moment of inertia

Friction Calculations

The frictional resistance and power consumed in a bearing may be calculated very easily if the shearing stresses at the moving surface are known. These may be found from Newton's law of viscosity, provided, as before, that the problem is sufficiently idealized or simplified. Newton's law states that the shearing stress at any point in a fluid is directly proportional to the rate of shear. In the case of a lubricating film, the rate of shear may be taken as equal to the velocity gradient. The constant of proportionality in Newton's law is called the *viscosity* of the fluid.

For example, suppose it were required to calculate the friction loss in the bearings of a grinding machine, running at a speed of $N=1200$ revolutions per minute, and lubricated with a light oil whose viscosity, Z, at the operating temperature, will be assumed equal to 30 centipoises, or 4.4×10^{-6} pound seconds per square inch. The length of each bearing is $L=6$ inches; diameter of journal, $D=3$ inches; and clearance, or difference between diameters of journal and bearing, one part per thousand. The frictional resistance F in each bearing, i.e., the equivalent tangential force at the surface of the journal, is equal to the shearing stress multiplied by the area on which it acts. The surface speed is equal to 20 revolutions per second multiplied by a circumference of 9.4 inches, or we may say $v=188$ inches per second. The film thickness, h, may be assumed uniform if the bearings are not too heavily loaded, and is therefore equal to half the total clearance, or 0.0015 inch. The velocity gradient, then, is given by $v/h=1.25\times10^5$ radians per second, or reciprocal seconds. Hence if the lubricant is one that follows Newton's law, the shearing stress will be the product of 4.4×10^{-6} into 1.25×10^5, or 0.55 pound per square inch. In each bearing this acts upon an area of 6×9.4 or 56.4 square inches, from which $F=56.4\times0.55$ or about 31 pounds. The work done against friction in foot pounds per revolution is 31×9.4 divided by 12, hence the power loss per bearing is 24.3 foot pounds multiplied by 20 revolutions per second, or for the whole machine, $24.3\times20\times2$ divided by 550, which is approximately one-and-three-quarters horse power. The coefficient of friction for a load of $W=720$ pounds on each bearing would be $F/W=31/720=0.043$.

Mathematical Complications

The foregoing load, $P=W/LD=720/18$ or 40 pounds per square inch of projected area, may be considered relatively light for the speed and clearance given, thus justifying the assumption of a nearly uniform film thickness around the bearing. Nevertheless, in most applications it is necessary to recognize the film thickness as a variable quantity, and it is here that the complications begin. Another complicating factor is the geometrical shape of the bearing. Full (360°) bearings are found in reciprocating engines, but in railway-car bearings and most of the larger types of industrial machinery partial bearings are more common, with contact arcs ranging from 90 to 180 degrees. Length-diameter ratios as low as one half are met in engine bearings and as high as three or four in line shafting.

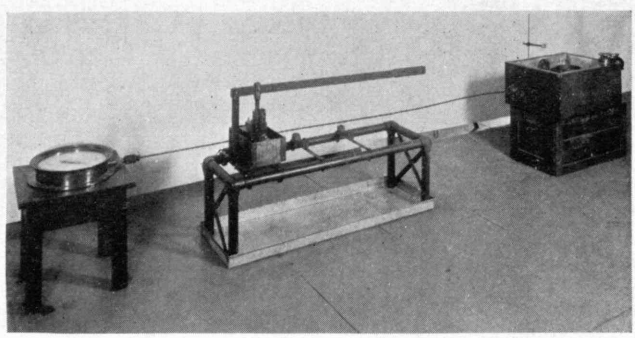
Reasonably complete mathematical solutions have thus far been worked out only for about five special types of bearings: (1) the full journal bearing of infinite length, operating under a load-per-unit of projected area which is relatively small compared to the absolute supply pressure in the lubricant; (2) partial bearings of infinite width; (3) plane surfaces of finite width as applied to thrust bearings; (4) partial bearings of finite width and optimum design; and (5) centrally loaded partial bearings of finite width and 120-degree arc. In most cases the lubricant is assumed to be of a uniform viscosity; in every case the load is assumed to remain constant in magnitude and direction; and the surfaces are assumed rigid and geometrically perfect. Solutions are conspicuously lacking for the full journal bearing of finite length with heavy or fluctuating loads, although they are very much needed to replace the element of guesswork in present-day engine design.

In its mathematical character, the hydrodynamic theory of lubrication is comparable with, and analogous to, the theory of elasticity, but has not yet covered so much ground in relation to its potential applications.

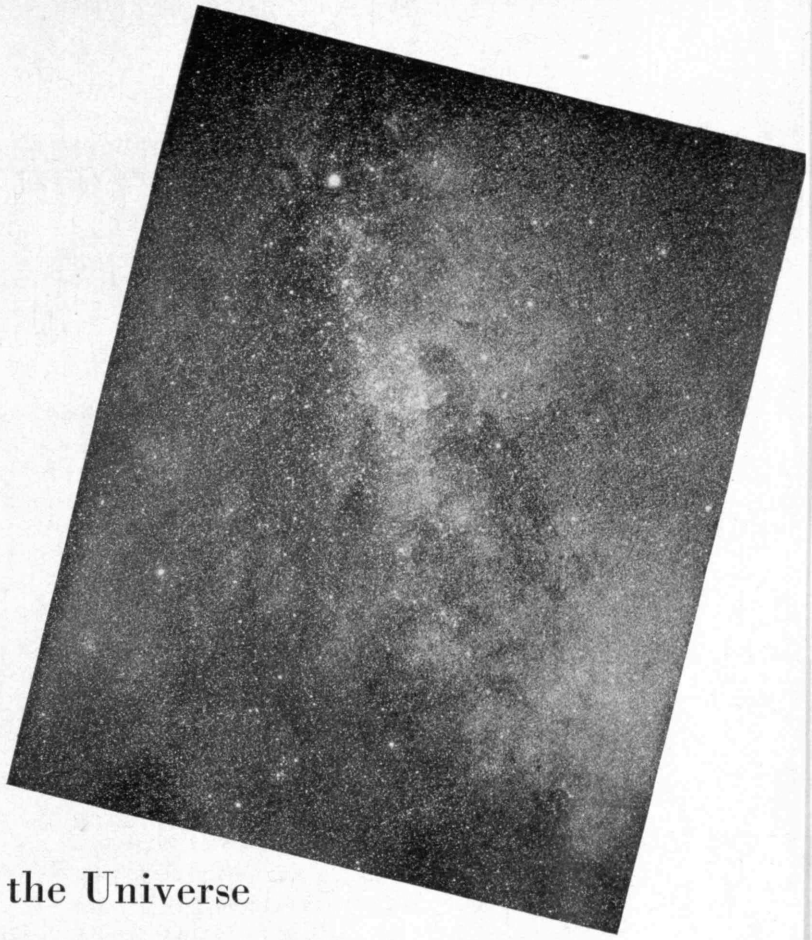
Model Experiments and Dimensional Theory

Because of the foregoing complications — side leakage, for example, in bearings of finite length — the hydrodynamic theory has been supplemented by experimental work of every description, including some very interesting experiments on models. Dr. Albert Kingsbury has integrated the differential equations for thrust bearings and partial journal bearings with the aid of an electrical analogy. Another type of model experiment is made possible by the principle of dynamical similarity.

Two journal bearings are (*Continued on page 192*)



Physical properties of lubricants. Some of the A.S.M.E. high pressure apparatus now at Brown University

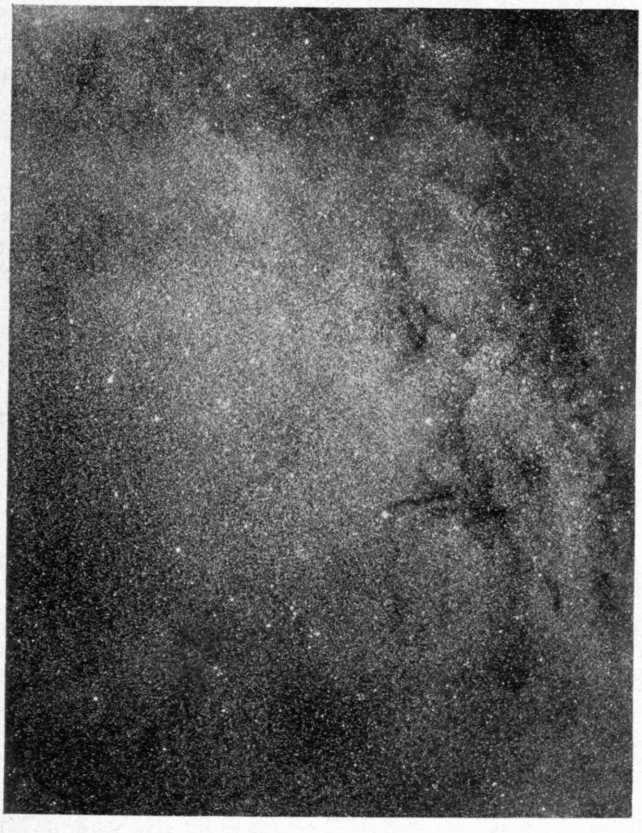


The Depths of the Universe

Four exceptionally fine star-field photographs made by Lewis P. Tabor, '22, at Roslyn House Observatory, Wynnewood, Penna. Owned and directed by Gustavus Wynne Cook, Roslyn House is probably the best equipped amateur observatory in the world.

Above, left. *Star field in Cygnus. Bright star at top, a Cygni (Deneb). At left of Deneb, the North America Nebula. At bottom of print, the small nebula at the left of the center is the Network Nebula, and the one in the center is the Filamentary Nebula. Exposure seven hours.* Above, right. *Star cloud southwest of γ Cygni, γ Cygni being the bright star about one inch from the left and three-quarters inch from the top. The cluster about one-half inch from the left and three-quarters inch from the bottom is N.G.C. 6940. Exposure three hours, 12 minutes.* Below, left. *Star field including the Great Nebula in Andromeda, M-31. Exposure eight hours, 30 minutes.* Below, right. *Star field in Cygnus, Lacerta, and Cepheus, interesting because of the dark markings, believed to be due to obscuring matter between us and the star cloud. Exposure four hours, 36 minutes.*

In exposing for these pictures it was necessary to bend the glass plates to bring the edges into focus, and each corner of the plate was focused separately. Imperial Eclipse plates were used



For Sharpening Your Wits

By Request — A Second Collection of Enigmas

By P. J. Rulon

ONCE upon a time there was a man who had two bars of iron. Each was about an inch in diameter and a couple of feet long. They looked exactly alike; but they weren't — one of them was magnetized and the other was not. The man had only these two bars of iron. Perhaps he was out in the woods, 50 miles from civilization, or maybe he was naked, in an Indian canoe without paddles, a thousand miles from land. In any case, his only possession besides these two iron bars was an insistent curiosity to know which of them was magnetized.

A month or so ago, a graduate student at the Institute heard of this man's predicament and, at the end of several minutes, offered his sincerest condolences for the man's plight, but proposed no procedure by which the inquirer might differentiate between the two bars.

This is the way people ordinarily react when they hear of the two gentlemen who got shipwrecked near a bell buoy. One dark night these two men started to row from the mainland to an island some distance offshore in a fairly heavy sea. To keep from getting lost, they followed the course taken by the steamers which served the island. This course was marked by bell buoys near which the steamers always passed. As one big ship went by, the wash upset the rowboat. Fortunately, the men were able to reach and cling to one of the buoys. When the next steamer went by, farther away than usual, they shouted themselves hoarse, trying to attract attention, but without success. Another steamer passed, this time very close to them, but they found themselves too hoarse to shout loud enough to be heard. The problem is: What should they have done to attract the attention of the steamboat crew?

For such enigmas there seems to be no definite method of solution. The attacker simply marshals all the facts he can command and sees whether or not he can put them together and evolve a successful proposal. Such is not the case with the following: Two cars passed through town at 20 miles an hour. One of them was just 100 feet behind the other. As soon as each car reached the city limits, the driver stepped on the gas (sounds natural, doesn't it?) and at 300 feet from the city limits, he was going 40 miles an hour. Each car maintained this speed after reaching it. The problem is: How far apart were the cars after they had both reached a speed of 40 miles an hour?

Faced with this question, most persons with technical training will reply that at 40 miles an hour the cars were twice as far apart as they were at 20 miles an hour, which means that they were 200 feet apart. In justifying this solution, mathematically inclined persons may calculate that the second car reached the city limits 3 9/22 seconds after the first one did. They will figure further than when this rear car reached the city limits, the front car was 125 feet ahead of it, going 30 miles an hour. In 3 9/22 seconds more the front car was 300 feet from the city limits, going 40 miles an hour, while the rear car was 125 feet from the city limits, going 30 miles an hour. In 3 9/22 seconds more the front car had gone another 200 feet at 40 miles an hour and was 500 feet from the city limits, while the rear car had gone 300 feet from the city limits and had attained a 40-mile speed. The cars then remained 200 feet apart.

Other persons, more or less mathematically inclined, may notice (and stick to it after noticing it) that these two cars were always the same number of *seconds* apart. At 20 miles an hour that number of seconds placed them 100 feet apart. At 40 miles an hour it would place them twice as many feet apart: 200.

With the bell-buoy problem, if you can't think of any way in which the two gentlemen could make any more noise, you ought to reverse your tactics and figure some way in which they could make less. Everyone who has seen a bell buoy knows that the two men could easily quiet the bell. To the steamboat crew, the silence of a familiar buoy would be just as disturbing as any amount of shouting. The two men could be pretty sure that if the officer on the bridge did not hear the bell, he would wind up a searchlight and start looking for the buoy, thus discovering their plight.

As for the two iron bars, one of which was magnetized, we need only recall what most of us know: A bar magnet exhibits no magnetic tug at its center. Just one test is necessary to discover which bar is magnetized: Bring the end of bar A close to the middle of bar B; if there is a tug, bar A is magnetized; if there is not, bar A is not magnetized.

Here is a concise little problem brought to mind by the case of the two automobiles aforementioned: A man dropped a rock from his roof. It fell the last half of the distance in half a second. How high was the roof? Of course, this is not much of a riddle if we all remember our introductory physics. But it is interesting, because nearly every engineer thinks he can sit down and solve it out of hand. It is not surprising to find five or ten minutes wasted in false starts before the answer comes out.

A farmer's son once had a problem, the solution of which would not have been speeded by college training. To encourage industry in the boy, his father allotted him a 16th of an acre of ground and told him he could have all the produce from it. The son decided he would plant fruit trees on his tract, and his father told him not to plant his trees any closer than nine feet apart. In laying out the plot, the father made it square, measuring 52 feet, two inches, on each side. (This did not make exactly a 16th of an acre, but it made almost that amount, and it gave the boy exact dimensions with

which to work.) The question was, of course, how to arrange the trees in rows so as to get the largest possible number of trees in the allotted space.

Among the algebraical problems, it is always interesting to find a soluble one which involves three unknowns and only two equations. One such occurs in the case of the three truck drivers who stopped at an all-night dining car for midnight refreshments. One of the men was very hungry and ate four sandwiches, a cup of coffee, and ten doughnuts. His bill came to 85 cents. The second man wasn't so hungry, but he succeeded in putting away three sandwiches, a cup of coffee, and seven doughnuts. His bill was 70 cents. The third man wasn't anywhere near so hungry as the first two. He ate only one sandwich, one doughnut, and one cup of coffee. The problem is: What should his bill have been?

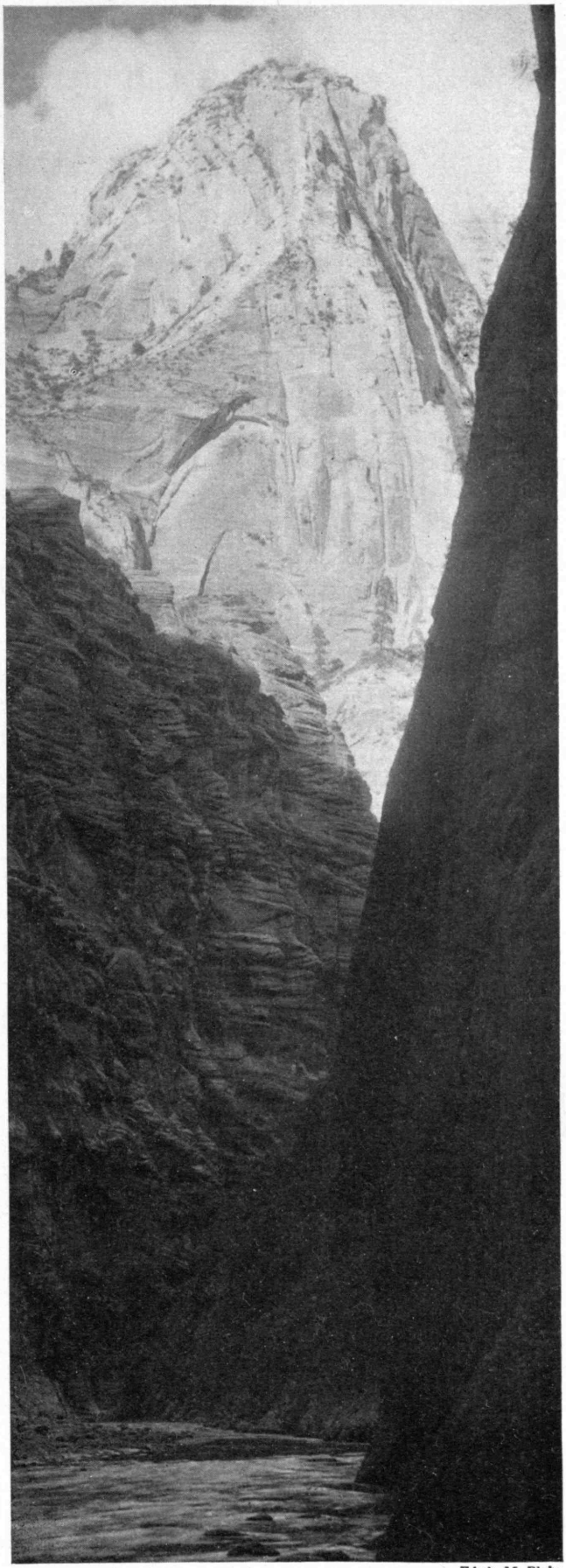
In the foregoing problem the equations are very easily set up. This is by no means always the case and sometimes a satisfactory set of equations is so much trouble to evolve that it is easier to solve the problem by some method of insight or ingenuity. Take, for example, the matter of the suburbanite who took the early train home. Mr. Jones always took the train which arrived at his station at exactly five o'clock. Being a very punctual gentleman, he required corresponding behavior in his employees, so that his chauffeur always arrived at the station at five o'clock, coincidentally with the train. Mr. Jones always alighted from the train, stepped immediately into his car, and was driven home. The chauffeur always drove at the same speed, whether Mr. Jones was with him or not, and whether the road was smooth or rough, crooked or straight. Well, one day Mr. Jones took an earlier train without notifying his chauffeur. He arrived at his station exactly an hour early. Realizing that he would not be met by his car, he immediately started walking toward home. The chauffeur left the house for the station at the usual time, so that after Mr. Jones had been walking for an interval, he was met by the chauffeur. He got into the car and was driven home, where he arrived ten minutes earlier than usual. The problem is: For what period of time did Mr. Jones walk along the road?

With that, we can justifiably abandon algebra, while we consider the case of the four tennis players who are the brain children of a couple of Boston publishers.

Messrs. Biff, Piff, Riff, and Tiff are broker, lawyer, publisher, and advertising man, but not respectively. They played three sets of doubles. The broker was an opponent of the lawyer and played with a racket borrowed from Biff. The broker and his partner won the toss and chose to serve. Riff, a better player than the lawyer, bet the broker on the outcome of the match. The first set went to Biff's side. Piff lost his service in the last game of the first set, and the advertising man won his service in the first game of the last set. The final score was 6 to 4, 3 to 6, 6 to 4. The problem is: What was the lawyer's name?

The solutions of these last five problems have been placed on page 200*f*. so they won't distract anyone who wants to educe them on his own.

To solve the problem of the height of the roof from which the rock was dropped, we take the traditional equation for *s*, the distance (*Continued on page 200*)



Edwin M. Blake

The End of the Trail (Zion National Park)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Stabilizing Enrollment

BEGINNING with the freshman class entering next fall, the Institute will adopt a policy of stabilizing the size of its enrollment, it was announced by President Compton following a meeting of the Institute's Corporation on January 8. This action was taken as a result of the unanimous recommendation of the Faculty, a committee of which has been engaged since last spring in studying the numbers of students which may be accommodated without overcrowding staff and other facilities. The committee has also given consideration to the problem of minimizing the wide fluctuations in registration which have occurred since the War, "to the end that we may at all times seek to give the best training anywhere available in engineering, architecture, and the sciences which underlie engineering, and at the same time use our available facilities most effectively."

The committee believes that the Institute "should aim to admit as high a proportion as possible of men potentially qualified to become leaders in the careers" for which it offers preparation. "To this end," the report continues, weight should be given in admitting students "not solely to scholastic capacity, but also to personal qualities making for all-round effectiveness, such as imagination, adaptability, resourcefulness, dependability, and coöperativeness."

As a first step in putting the stabilization program into effect, the freshman class for the coming two years is to be kept under 600 instead of permitting it to exceed this number as it might if the present trend continues. This year in a total registration of 2540 there are 561 first-year students and in 1934 there were 542. Stabilization will enable the administrative officers to draw plans now for staff personnel for first-year instruction for the next two years. Thus by setting a maximum number of freshman students, the report says, the Institute will avoid the "difficulties of rapidly expanding a staff and still maintaining the quality of its personnel."

The Committee on Stabilization of Enrollment consisted of Dean H. E. Lobdell, '17, Chairman; Professor Nathaniel H. Frank, '23; Professor William H. McAdams, '17; John M. Nalle, '20; Professor Brainerd A. Thresher, '20; and Professor Carlton E. Tucker, '18.

President Compton also announced that as the result of a study by a faculty committee, it has been decided to permit students of all classes, with a cumulative rating of 4.00 and above to take examinations for advanced standing in subjects of prescribed courses for which they have never been registered. The committee found that many capable and ambitious students are anxious to study and pass subjects on their own initiative without instructional assistance, thereby releasing a portion of their time for the study of more advanced subjects. In the upper years, it was suggested, the accumulated term time might well be devoted to graduate subjects in preparation for graduate work. The Committee on Examination for Advanced Standing consisted of Professor Leicester F. Hamilton, '14, Chairman, Professor Henry B. Phillips, and Professor Thomas K. Sherwood, '24.

Radium Detector

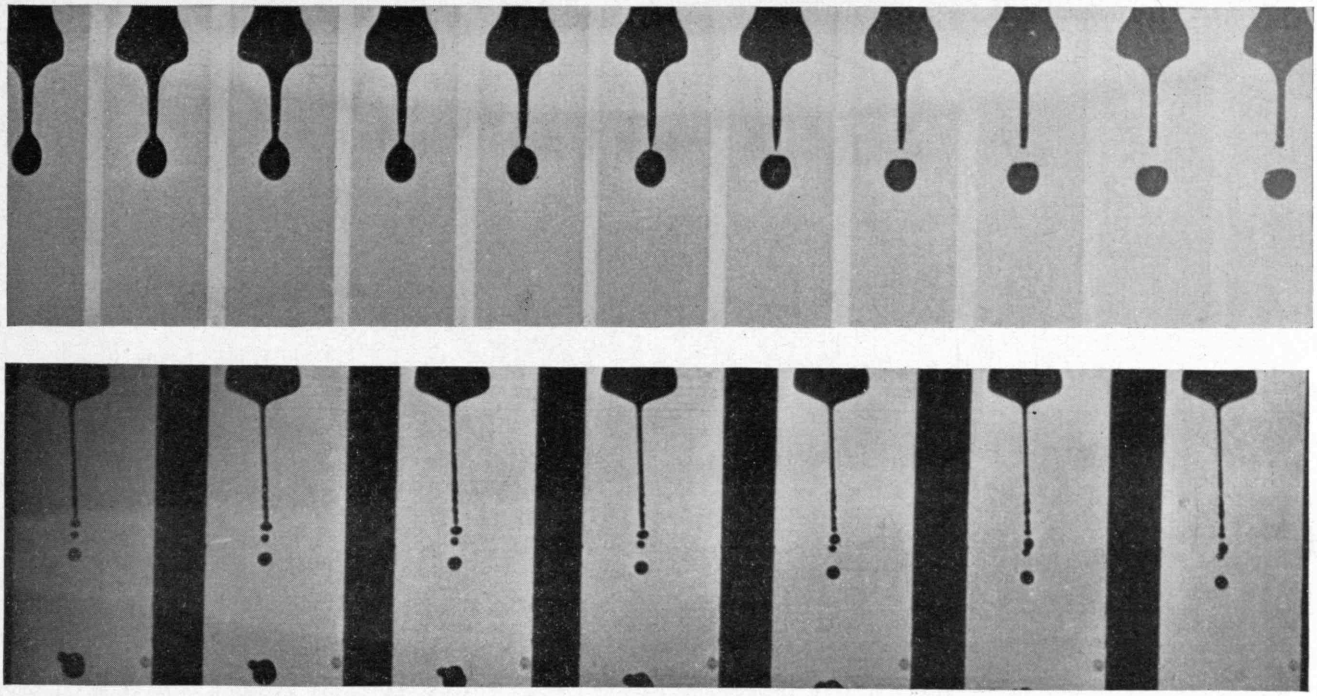
RECENT advances in the physics of radioactivity detection have led to the development in the Institute's Department of Physics of a gamma ray detector, an extremely sensitive instrument for measuring such radioactive materials as radium, thorium, and uranium, by means of their invisible gamma radiations. The significance of this device lies not only in its usefulness for basic studies in radioactivity, but in its application medically for diagnosing radium poisoning.

Radium and its associated decay products continually emit an assortment of penetrating radiations which are hazardous to health, unless safeguarded in ways which have been discovered in the course of developing the use of radium for treatment of cancer and related diseases. When ignorance or carelessness permits, these radiations may induce incurable radium burns or, when radium is ingested, chronic radium poisoning.

Several years ago the cases of five New Jersey girls, who had ingested fatal doses of radium while painting luminous figures on watch and clock dials, attracted wide attention. Hundreds of similar cases remained unpublicized. Post-mortem examinations showed that only ten millionths of a gram of radium, deposited in the bones by body chemistry, would cause death. In spite of this knowledge, some industrial users of radium failed to modify their shop technique so as to protect their workers properly.

Scarcely a month now passes in which a new case of chronic radium poisoning is not discovered. Some of these are industrial poisoning cases, but others arise from drinking radium water tonics and nostrums. Still others are the result of intravenous injections of radium salts, made years ago by uninformed physicians who were unsuccessfully attempting to treat arthritis and other ailments with the unexplored magic of radium.

The gamma ray detector, which was designed by Dr. Robley D. Evans, now makes possible unambiguous laboratory tests which can reveal the presence of chronic radium poisoning five years before any clinical symptoms appear. The development of these instruments is one of Technology's research projects, which will soon make generally available an instrument more than one hundred times as sensitive as those previously used, yet so simple that it can be successfully used by the practicing physician, factory inspector, life insurance examiner, or routine testing laboratory analyst.



Top. *High-speed motion picture (960 exposures per second) showing formation of first drop of benzene exuding from a Traube stalagmometer, as used for relative surface-tension measurements in industry. This picture, as well as the lower one, is selected from a series of cinematographs made by Professor H. E. Edgerton, '27, (Electrical Engineering Department) and Dr. E. A. Hauser (Chemical Engineering Department) during their joint research in using high-speed motion-picture technique for the study of physicochemical and colloidal-chemical reactions. (Watch the flattening out of the drop. This is the first part of an oscillation in drop shape now being investigated in detail with the idea of obtaining more accurate information on surface tension in general.)* Bottom. *Flow of ethyl acetate from the same orifice. The picture shows that the liquid does not wet the lower surface of the stalagmometer, but flows in a continuous stream prior to breaking up in several droplets. The flow, on careful examination, shows column formation. The increasing importance of surface tension in a variety of industrial processes warrants such refined study of the phenomenon*

It is adapted not only to the early discovery of radium poisoning in humans, but to the essential protective work of Federal analysts in detecting radium-contaminated cosmetics, tonics, and nostrums. If backed by adequate legislation, these poisonous products could be quickly removed from commerce.

Toward Better Engines

IMPORTANT studies of airplane engine performance with the object of making improvements in their design is now in progress at the Institute under the auspices of the National Advisory Committee for Aeronautics. In this research, which is being carried on in the Automotive Engine Laboratory of the Department of Mechanical Engineering, two problems are being studied. The first concerns the two-stroke, or what is more popularly known as the two-cycle engine for aircraft. The advantage of this type of engine, which has long been recognized by engineers, is that it gives one power impulse per revolution instead of one in two revolutions as in the four-stroke engine. Furthermore, the ported two-stroke engine is perhaps the simplest prime mover known and as such it is inexpensive to manufacture.

In the present stage of knowledge the design of the two-stroke engine is much more difficult than the conventional four-stroke power plant. As a result the two-stroke type has not been used extensively in aircraft. The difficulty of design of the two-stroke engine is largely due to the fact that the burned gases cannot be forced out of the cylinder by means of the piston as in the four-stroke engine, but must be displaced by the incoming charge. This must be accomplished with a minimum amount of mixing of the burned and unburned charges, and with the least possible loss of fresh charge through the open exhaust valve. The process of displacing burned gas by means of fresh charge, known as "scavenging," is the particular problem now under investigation.

The Institute's engine laboratory is particularly well fitted to carry out this investigation because of work previously done here on direct fuel injection, which definitely improves the fuel consumption and control of two-stroke engines, and because of special facilities for investigating the charging of the cylinder.

The second investigation in this research program concerns the dynamic characteristics of the induction system of conventional engines. By virtue of its mass, the air in the inlet pipe of an engine tends to continue to flow after it is once started. Because of this phenomenon, it is possible, without supercharging, to fill the cylinder of an engine with air at several pounds higher than atmospheric pressure, thereby increasing its output. The Automotive Engine Laboratory has been engaged in work along these lines for some time with a high degree of success, for, by proper regard for the dynamics of the inlet system, it has been found possible to achieve the effects of a moderate degree of supercharging. The results of this work are already having effect upon modern aircraft engine design, and it is

hoped that its completion will produce important data for improvements in the design of the induction system.

Science at St. Louis

THE Institute was appropriately represented at the recent annual meeting of the American Association for the Advancement of Science at St. Louis by President Compton and Vice-President Vannevar Bush, '16. As retiring president of the association, Dr. Compton made the reply to the address of welcome at the opening session on December 30, and was busy throughout the week at various technical and business meetings. On January 2, Dr. Bush gave the Josiah Willard Gibbs Lecture, choosing as his subject, "Instrumental Analysis," a field in which he is internationally distinguished. It will be recalled that last year he was invited to address the Fourth International Congress of Applied Mechanics in England on the subject of analyzing machines.

Among the many important papers presented during the meeting was one by Arthur C. Ruge, '33, Research Associate in the Department of Civil Engineering, on "A Machine for Reproducing Earthquake Motions Direct from a Shadowgraph of the Quake." The paper, read for Mr. Ruge by Captain N. H. Heck of the United States Coast and Geodetic Survey, concerned the design and operation of the unique shaking table described in detail in The Review last month.

In the huge exhibition hall, the Institute was represented by an exhibit of scientific and engineering instruments and research apparatus illustrating important investigations now in progress at Technology. These included Professor Evans' gamma ray detector (see page 186), and an instrument for analyzing radio listening habits, developed by Professors Louis F. Woodruff, '18, and Robert F. Elder, to study the effectiveness of radio programs. The Van de Graaff method of generating high-voltage direct current was demonstrated by a table model of the huge generator, built at the Institute's research station at Round Hill. The division of aeronautical engineering of the Department of Mechanical Engineering contributed a gyro-drive testing device, which makes it possible to study variations in rotor speeds in aircraft instruments due to changes in altitude and atmospheric pressure. A stroboscopic lighting device designed by Professor Harold E. Edgerton, '27, is used in this apparatus for stop-motion studies of the behavior of rotors at various speeds.

Another exhibit was a lithium-fluoride crystal three inches in diameter, grown by Dr. Donald C. Stockbarger, '19, of the Department of Physics, and described in The Review in January. The Department of Biology and Public Health contributed a hot-wire thermal precipitator for sampling dusty atmospheres. This device, designed in England for the Medical Research Council, was constructed at the Institute for research to determine the density of dust to which industrial workers are exposed. Dr. Ralph D. Bennett of the Department of Electrical Engineering provided a directional cosmic-ray counter, in the design of which he had an important part. Photomicrographs of textile fibers in color were shown through the courtesy of Professor Edward R. Schwarz, '23. Photographic plates of the spectrum, provided by Professor George R. Harrison, and progress photographs of the scale model of the Cape Cod Canal built under the direction of Professor Kenneth C. Reynolds, '25, added much to the interest of the exhibit. The coöperation of Frederick B. Wolf, '28, Secretary of the Technology Club of St. Louis, in arranging for assistance in presenting the Institute's exhibit was responsible to a large degree for its success.

Alumni Day Plans

WE ARE enthusiastic over the plans now being developed for Alumni Day, which falls this year on June 8. Among the items on the program will be an important conference, to which all alumni are invited, on transportation. Invitations are being issued to nationally known figures in the four major transportation fields — rail, air, highway, and water — and with these actively participating in the conference, attending alumni will be assured of a stimulating and provocative symposium.

This conference, together with the social events and departmental meetings on the program, will provide a reunion that will be important as an educational event, enjoyable as an opportunity to renew Technology contacts, and entertaining as an alumni festival.

Sail Ho!

THE proposal recently submitted at a mass meeting of undergraduates of the Institute that sailing be made a student activity, received an enthusiastic response, and plans have already reached the stage where it is possible to announce that a fleet of sailing dinghies will be ready by spring. Twenty-five boats are assured and the prospects are that when the ice leaves the Charles River Basin the bright colored sails of at least thirty will make the river as picturesque as the Zuider Zee crowded with Dutch boats.

The enthusiasm of the students for the new activity is matched by that of Professor Erwin H. Schell, '12, Head of the Department of Business and Engineering Administration, whose efforts have been largely responsible for the rapid progress and the donation of dinghies by members of the Corporation and Alumni.

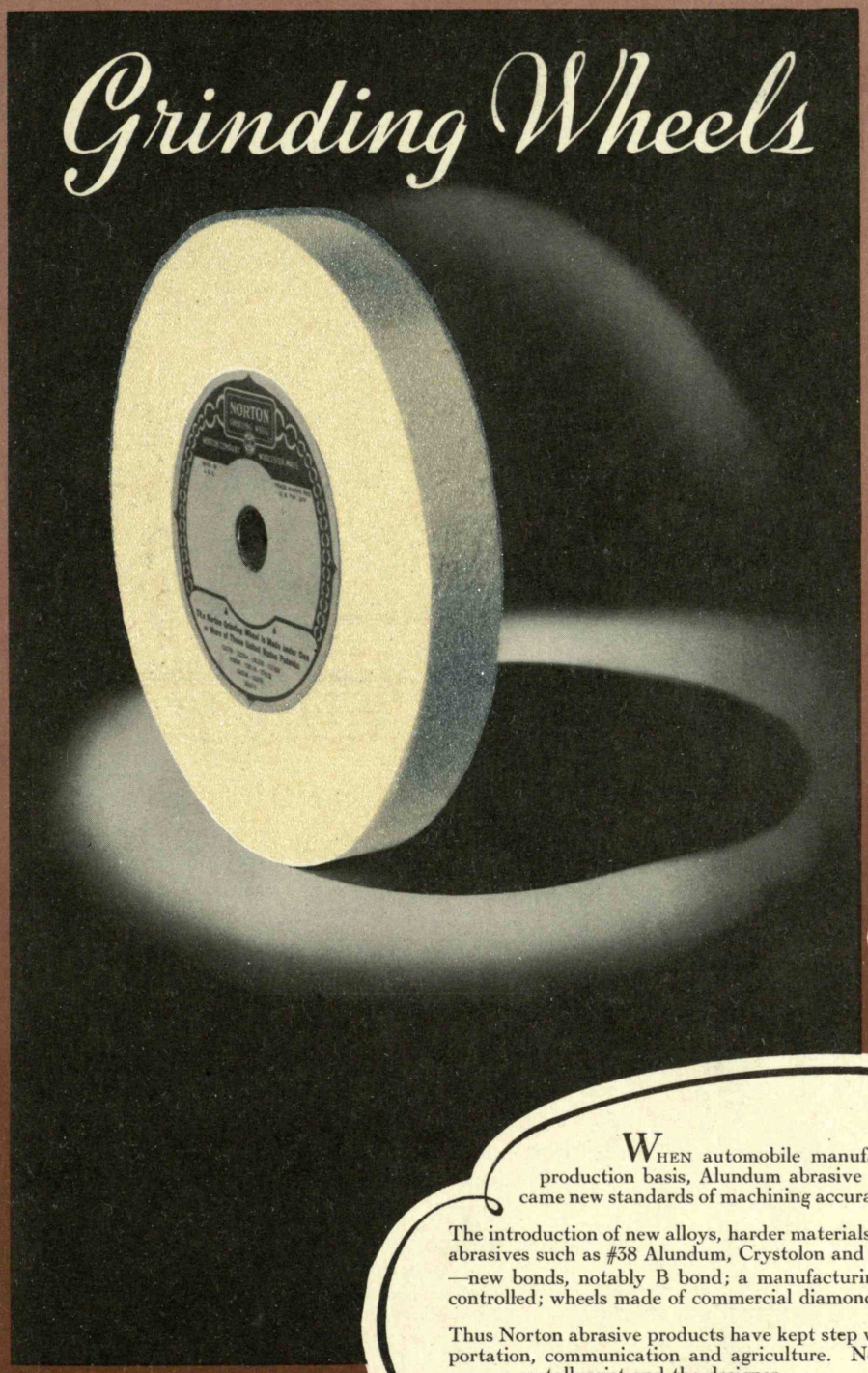
Small-boat sailing, particularly in the Frostbite type of dinghy, has developed swiftly in the past few years, bringing to thousands the pleasures and benefits of a sport which hitherto has been somewhat limited by the expense of boats. The new small dinghies are relatively inexpensive and offer every opportunity for learning the science of sailing.

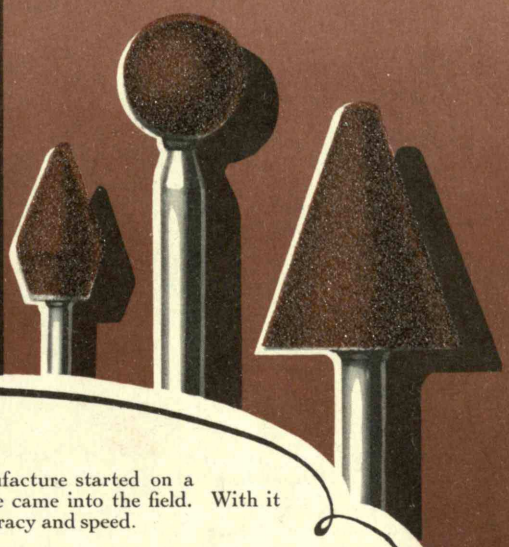
Technology will probably be the first college in the country to include the sport in its official undergraduate program. Several colleges have private student sailing clubs, but undergraduate leaders have found no record of a recognized sailing activity.

President Compton, who considers sailing a healthful recreation and wholesome training, donated the first dinghy, and others were presented by Alfred L. Loomis; F. Wright Fabyan, '93; Lammot duPont, '01; Lyall L. Stuart, '21; Barron P. Lambert,(*Continued on page 189*)

Grinding Wheels

Keeping Step with Industry





WHEN automobile manufacture started on a production basis, Alundum abrasive came into the field. With it came new standards of machining accuracy and speed.

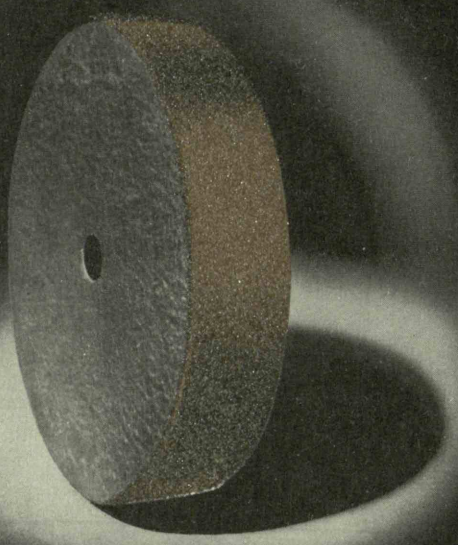
The introduction of new alloys, harder materials, brought other Norton developments—abrasives such as #38 Alundum, Crystolon and Norbide —new bonds, notably B bond; a manufacturing process by which wheel structure is controlled; wheels made of commercial diamonds.

Thus Norton abrasive products have kept step with developments in land and air transportation, communication and agriculture. Norton Research has kept step with the metallurgist and the designer.

It is the combination of correct abrasive, right type of bond and ability to duplicate the wheel hardness and the wheel structure that makes for correct cutting action.

NORTON ABRASIVES

Polishing Abrasives

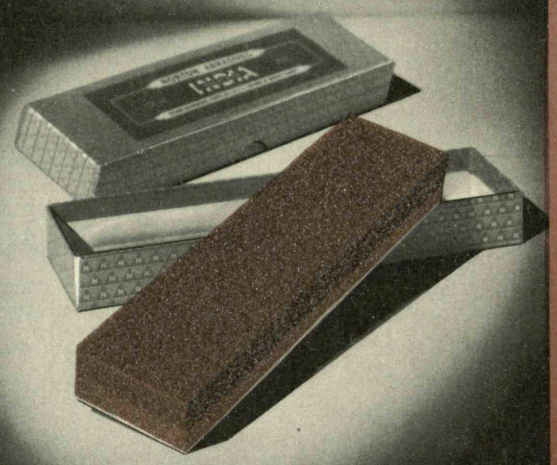


To meet present polishing wheel requirements attention must be given to character of abrasive, shape of grain, surface of grain, capillarity and to a uniformly sized product.

Six types of Alundum Abrasive—two types of grain shapes, three types of grain treatments in each—are available.

Norton Laboratories have a completely equipped polishing department for experimental work. The call for their services comes from the metal, stone and glass industries. A special product known as Norton Lens Finishing Flour is used in optical work. Especially prepared Crystolon Abrasive is meeting with a high degree of success for stone polishing and in glass work.

Sharpening Stones



The bench stone—most familiar of oilstone shapes—may be artificial or natural. Best known is the India oilstone—made of Alundum abrasive. If a slightly different cutting action is desired, a different edge required on the tool, a stone of Crystolon abrasive can be used.

The natural stones are: Hard Arkansas, Soft Arkansas and Washita. The sharpening stone catalog lists a surprising variety of shapes and sizes of sharpening stones, hones and abrasive files. The biggest surprise is the many shapes of small stones for die and tool work.

The sharpening stone line is sold by Behr-Manning, division of Norton Company, Troy, New York, manufacturers of coated abrasives, sandpaper.

NORTON COMPANY
Worcester, Mass.
Behr-Manning Corporation, Troy, N. Y.
Division of Norton Company

NORTON ABRASIVES

'26; Marshall B. Dalton, '15; J. Franklin McElwain, '97; Paul W. Litchfield, '96; William R. Kales, '92; J. Howard Pew, '03; Francis C. Holmes, '92; Duncan R. Linsley, '22; Philip Stockton, '99; Frederick T. Moses, '07; Richard L. Bowditch, '23; Arthur C. Dorrance, '14; Philip W. Moore, '01; Henry E. Warren, '94; W. Clark Arkell, '10; Frederick A. Flood, Donald W. Douglas, '14; Luis deFlorez, '11; and E. Leland Wemple, '08. The twenty-fifth boat was donated anonymously.

President Compton appointed a committee to design a boat suitable for racing as well as for training a large number of students. The design has been completed by the Department of Naval Architecture and Marine Engineering and dinghies will be built immediately. Professor George Owen, '94, is chairman of the committee and his associates are Henry A. Morss, '93, of the Corporation, and Walter C. Wood, '17, of Providence, R. I.

Meantime students are learning the fundamentals of sailing in free courses given by Professor Owen, designer of many famous yachts and a skillful skipper, and Robert W. Vose, '31, of the Department of Mechanical Engineering. The course will be supplemented with lectures by prominent yachtsmen.

With more than 400 students signed for the activity and an instructing staff of more than 100 undergraduates whose sailing experience fits them to introduce landlubbers to the sport, sailing promises to become one of the most popular of the Institute's thriving student activities.

Physics at M.I.T.

BELOW is a condensation of an important report recently presented to the Corporation by its Visiting Committee on the Department of Physics.

DEPARTMENT OF PHYSICS*

As physics is the backbone of all the sciences and of all the various branches of engineering, the members of the Committee were especially interested in hearing in considerable detail about the undergraduate courses and in learning of the close relations existing between the work of the Department of Physics, on the one hand, and of the Departments of Mathematics and Electrical and Mechanical Engineering, on the other. The Committee wishes especially to endorse the emphasis which is being placed on methods and principles rather than on formulas.

The teaching of the first two years forms a large part of the teaching load of the Department and is the period at which most contact is made with other departments. During the past year, interesting developments have occurred both in freshman and in sophomore work. The freshman subjects, 8.01 and 8.02, have been evolving gradually for a number of years, under the guidance of Professor Frank, '23. This year a particular effort has been made to correlate them with the applied mechanics given by the Mechanical Engineering Department, and in this connection, members of the staff of that department have been visiting the classes in 8.01 and 8.02 and have made interesting comments and suggestions. The first few weeks of the term, in particular, seem to present difficulty, and it was suggested that the work in statics might well be given at the beginning, instead of work in kinematics and dynamics. The correlation between physics and mathematics in these first few weeks is particularly important, since the student must at the same time learn the fundamental ideas of calculus, and must apply these to his kinematics and dynamics. Though a careful correlation is made at present, it would give the student more time to assimilate his mathematics if statics, which does not demand calculus, were placed at the beginning. It is understood that a modified form of this arrangement will be tried during the coming year. A further suggestion from the Mechanical Engineering Department is that the units and nomenclature, both in mechanics and heat, should be uniform in the two departments.

In regard to the sophomore electricity and optics, 8.03 and 8.04, a new development has been undertaken this year in connection with the Electrical Engineering Department. The sophomore students of Courses VI, VIII, XIV, and XVIII have been put in a special group of 8.03 and 8.04, under the direction of Professor Wulff. They are able to undertake a somewhat more thorough course of study in electricity than the students of other courses. This subject starts with a more fundamental treatment of electrostatics than could be given to the sophomores of other courses and carries the treatment of electricity up through Faraday's induction laws in the first term, then treats the remaining electrical topics, electric waves, and optics, in the second term. Though the program is ambitious and the work difficult, the students this year do not seem to find it beyond their ability. The students in Courses VI, VIII, and XIV now take electrical engineering 6.00 in the second term of the sophomore year, and the Electrical Engineering Department is revising this subject, so that it is now a fundamental treatment of electric circuits in theory and practice, carefully correlated with the material presented in the special sections of 8.03 and 8.04. This development has been arranged by close coöperation between members of the staff of the Departments of Physics and Electrical Engineering. The Electrical Engineering Department had come to feel that the fundamentals of electromagnetic theory should be presented to all the students of the Department at an earlier period of their training, and has been working out a basic course to be taken by all students, starting with fundamentals and including, later, the branches of electricity needed for all types of practical work. In connection with this revision, the coöperative scheme with the Physics Department has been developed, in which the training in electricity is carried in a continuous way from the beginning of 8.03 through the whole basic course. . . .

Graduate Work

The members of the Committee have been greatly impressed by the enthusiastic scientific spirit of the staff, also by the volume and quality of the scientific

*The Visiting Committee which made the above report consisted of: William D. Coolidge, '96, Chairman, Alfred L. Loomis, Frank A. Vanderlip, Donald G. Robbins, '07, Charles G. Abbot, '94, Bailey Townshend, '16, Henry A. Barton, F. K. Richtmyer.

work of the Department, shown in the large number of papers recently published. However, since the meeting of the Committee held during the year 1933 to 1934 was devoted almost entirely to the purely scientific research of the Department, this phase of the Department's activities was not elaborated upon at the present meeting.

The subject of applied physics has attracted considerable attention during the past year. A conference on that subject was held jointly by the American Institute of Physics and the National Research Council in the course of the year, focussing the attention of both physicists and industrial leaders on the possibilities of applying physics to industry, and this question was made a principal topic of discussion at the meeting of the Committee. Through the activity of the Division of Industrial Coöperation and Research, the industrial cooperative courses, and other vital connections with industry, the Institute is in an especially favorable position to offer instruction in applied physics, and with the new Eastman Laboratory, the equipment of the Institute for graduate work both in pure and applied physics is unexcelled. There is already a large amount of work in applied physics being carried on in the Department, particularly in the line of research.

Professor Harrison, in the development of his spectroscopic program, is working on the applications of spectroscopy (including both qualitative and quantitative spectroscopic analysis) to a wide range of problems in chemistry, metallurgy, and biology, and is attracting much attention among experts in those fields, especially in connection with his summer spectroscopic conferences. Professor Hardy's, '18, work in color measurements, including the development of the color analyzer, is opening up a new era in those industrial fields — textiles and dyestuffs, printing ink, and so on — which depend on accurate measurement of color. Professor Warren, '24, in his researches on crystal structure of minerals and glasses, is in a field where he makes constant valuable contributions to the geologists, and to workers in the fields of ceramics and glass technology. In a somewhat related field, Professor Stockbarger, '19, by his improvement of the method of crystallizing lithium fluoride and other compounds from the melt is developing these substances into optical materials of real importance. Much of Professor Nottingham's work on thermionic emission is of importance to the electrical industry, where understanding of thermionic processes is essential in connection with vacuum-tube technique. Professor Van de Graaff's work on high voltage, though undertaken primarily as a tool in the field of nuclear research, has led to developments in the technique of high-voltage production and control which, with the collaboration of the Electrical Engineering Department, promises valuable advances in the engineering field. Much of Professor Evans' work in radioactivity represents another practical application of nuclear research, though to other sciences rather than to industry, since it is concerned with the geological problem of the age of the earth, on the one hand, and with biophysical applications, on the other. Professor Wulff has been making investigations of the properties of surface films on metals, which should be of importance in the problem of corrosion. Finally, on the theoretical side, much of the work of Professors Stratton, '23, and Morse is of practical importance in such varied fields as electrical and acoustical radiation, hydrodynamics, and internal-combustion engines. A number of other projects in the Department, bearing more or less directly on practical applications, could be mentioned. It will be seen, however, that these all refer to research rather than to the training of physicists for industrial and applied work.

Wide World

Dr. Warren K. Lewis, '05, Professor of Chemical Engineering at Technology, receiving the Perkin Medal on January 10 from Professor Marston T. Bogert of Columbia, "in recognition of his activities as the father of modern chemical engineering and his training of and inspiration to many of the present and potential leaders of the profession"

Before considering the training of the applied physicist, it is well to survey a few of the fields with which he is likely to be concerned and types of problem met there. The applied physicist in industry is likely to meet new and unusual problems, and should be able to solve them better than the engineer with his more restricted training. Much industrial research in physics involves, at the same time, problems in chemistry and in the properties of materials, and it is of the greatest importance that the applied physicist should be well trained in chemistry and should be at home in a wide variety of fields. In many cases, physical chemists rather than physicists are employed, even for investigations that are really more physics than chemistry, for the chemist knows the necessary part of physics, whereas physicists often know no chemistry. Nevertheless, there are many research problems in industrial laboratories which need the sort of logical training which the physicist receives, rather than the more empirical point of view of the engineer, and it is likely that works laboratories will, in time, employ better trained men. It is imperative, however, that these men have a broad training, rather than a narrowly specialized one.

In addition to positions for applied physicists in industry, there are a number of other fields in which applied physicists would be useful and which physicists in many cases have not entered. For example, geophysics, involving a knowledge of classical physics and of geology, might be much developed, if suitable physicists

could be found. At present, electrical engineers are largely employed for this work. Nevertheless, good physicists and mathematicians have taken the lead in this field. Biophysics is a field which is rapidly developing and few physicists have entered it, in spite of the fact that almost no biologist is equipped with enough knowledge of physics to fit him for it. Not only in the purely scientific side of biophysics, but also in the medical and therapeutic side, there is a large field for the physicist with biological training, as for instance in the medical uses of x-rays, radioactivity, and high voltages. The subject of x-ray crystallography is generally pursued in industrial laboratories by chemists, because they have the necessary knowledge of the materials concerned, but physicists are much better fitted to do it, by reason of their better mathematical training. Consulting physicists and physicists engaged in patent law are altogether too rare, and those interested in applied physics would do very well to go into these fields, making physics a profession, instead of merely looking for jobs. Doubtless in other fields where physicists are not employed at present, openings for them could be found. It would be very appropriate for such an institution as the American Institute of Physics to make a survey of opportunities for physicists in industry.

With these considerations in mind, the training of applied physicists can be taken up. This training should differ from that of the pure physicist, partly in factual content, partly in point of view. The viewpoint of the academic physicist is that he is interested in applying existing knowledge for practical purposes. A part of the training should consist in emphasizing this difference in viewpoint. In addition, however, applied physicists should receive different information in their courses. They should have more training in chemistry and the properties of matter than the average physics student receives. They should be given a broad training in many fields of physics, and should be made to feel confident and at home when attacking new problems. In general, they do not need as complete a training in mathematical physics and in modern physics as is necessary for research in those branches of pure physics which are developing most rapidly at present. The emphasis on chemistry and the properties of matter is a rather difficult one to make, for students of physics in general do not seem to be much interested in chemistry. This is probably on account of its method of presentation by teachers of chemistry, in which chemical facts are often not presented as part of a logical system, but as a series of isolated experiments which constitute a tax on the memory and appear to be unrelated. It might be better if the student of physics could be presented early in his chemical career with the atomic theory and a picture of electron configurations, followed by a presentation of the periodic table, so as to perceive an order in the experimental facts. Such a course on properties of the elements and compounds, presented from the point of view of the periodic table should, of course, be followed, for the student of applied physics, by a brief course on the simpler organic compounds and after this by a thorough course in physical chemistry. Such a chemical training, together with most of the experimental physics which the physics students learn, the simpler parts of mathematical physics, and the descriptive parts of modern physics, should be the backbone of a course in applied physics. . . .

Presented by Charles Hayden, '90, this memorial cup to the late Allan Winter Rowe, '01, will serve as a trophy for a new Henley rowing regatta on Lake Quinsigamond, Worcester, Massachusetts

The Committee concurs with the members of the Department in feeling: that more attention should be given to the training of physicists for industrial research; that these men should be given a different training from those who are to enter the teaching profession; that they should have more chemistry, more practice in the application of the simpler branches of mathematics, and more familiarity with the properties of materials. The Committee, therefore, wishes to endorse heartily the plan, going into effect next year, of giving a doctor's degree for work primarily in applied physics. It seems that men working for this degree can be given a training which will fit them better than either the Ph.D. or the engineering training of the past for the work of the industrial laboratory, as well as for work in such borderland sciences as biophysics, geophysics, and patent law.

College Pensions

THE provisions of the social security law exempting colleges from participation in the national retirement plan and in taxation for unemployment compensation, emphasizes the urgent need for independent retirement plans in all such educational institutions. So declared Rainard B. Robbins, Secretary and Actuary of the Teachers Insurance and Annuity Association of America, in an address before the 16th annual meeting of the Association of University and College Business Officers of the Eastern States of which Horace S. Ford, Treasurer of the Institute, is Secretary.

Speaking on "The Retirement Problem," Mr. Robbins discussed various college pension plans, directing

attention to the fact that although educational institutions had been leaders in providing for security in old age, only about one third of the nation's colleges have retirement plans.

In his discussion of the social security law and its effect on colleges, Mr. Robbins said: "This law offers a national subsidy to the states for relief of specified needy classes, undertakes to encourage states to enact laws for unemployment compensation and establishes a Federal, compulsory, jointly contributory, retirement plan that will cover about half of the gainfully occupied persons of the United States. Participation in this plan is independent of rank or salary; there is no such thing as a waiting period. . . . The retirement plan and the arrangement for unemployment compensation are the parts of most interest to employers. Employment for educational institutions is excepted from both of these sections of the law so that colleges and their employees cannot participate in the national retirement plan. . . .

"In the future, when half of all gainfully occupied persons are being taxed to provide for noncashable retirement benefits, the college that lays no plans for retirement of its employees, whether faculty, clerical, or manual, will be offering employment, that in this essential particular, will be less attractive than will then be required of all industrial employers engaged in business for profit. It, therefore, seems probable the Social Security Law will encourage the creation of retirement plans in colleges that have none. . . ."

THE OIL-SHED FALLACY

(*Continued from page 182*)

dynamically similar if they are first geometrically similar, and then operated under such conditions that the combination variable ZN/P has the same numerical value for the model and the full-sized machine, and provided certain other requirements are fulfilled. Under these conditions the friction loss can be predicted for the larger machine from observations on the model, since the coefficients of friction will be identical in the two cases. In fact, all performance characteristics will be identical which can be expressed by *dimensionless variables*. Observations on different oils, at all temperatures, speeds, and loads within the range of thick film lubrication, may be coördinated on a single chart by plotting against ZN/P.

The now familiar ZN/P principle, as described above, was first used by the writer (with an unpopular Greek letter in place of Z, to represent the viscosity) over twenty years ago in publishing the results of his experiments conducted under Professor Gaetano Lanza at the Institute. Another interesting conclusion from the dimensional theory of lubrication is that the load capacity of any bearing, defined as the load which reduces the film thickness to some arbitrarily chosen safe value, must be directly proportional to the viscosity multiplied by the speed. This has been confirmed experimentally, thus neatly disposing of the "$P\ V$ fallacy," according to which the safe load would be inversely proportional to the speed. These conclusions followed very simply from the theory of dimensions, a method of attack which had already been found useful in aeronautics, hydraulics, and other branches of engineering.

Temperature Rise in Bearings

In the continued operation of any machine the bearing temperature slowly rises until, after several hours, it may arrive at a steady value known as the equilibrium temperature. In the earlier days of lubrication theory the calculation of this temperature was considered to be an exceedingly puzzling, and possibly an indeterminate, problem. Yet until the permanent running temperature is known, the viscosity factor entering the hydrodynamic equations must be treated as an unknown quantity. A rational solution was found by setting up three simultaneous equations defining the heat transfer characteristics of the bearing, the mechanical friction law for the bearing, and the viscosity-temperature characteristics of the lubricant. These three equations involve three unknowns, H, Z, and T, all remaining factors being treated, for the time being, as constants. The first equation is an empirical one expressing H, the heat (in work units) generated by friction and transferred per unit time, as a function of the temperature elevation T. The second equation, either empirical or derived from the hydrodynamic theory, expresses H as a function of the instantaneous viscosity, Z. The third equation gives Z as a function of T. A definite solution for all three quantities may now be obtained either analytically or graphically, according to the complexity of the particular problem. Detailed results will be found in the September, 1935, issue of the *Journal* of the Franklin Institute.

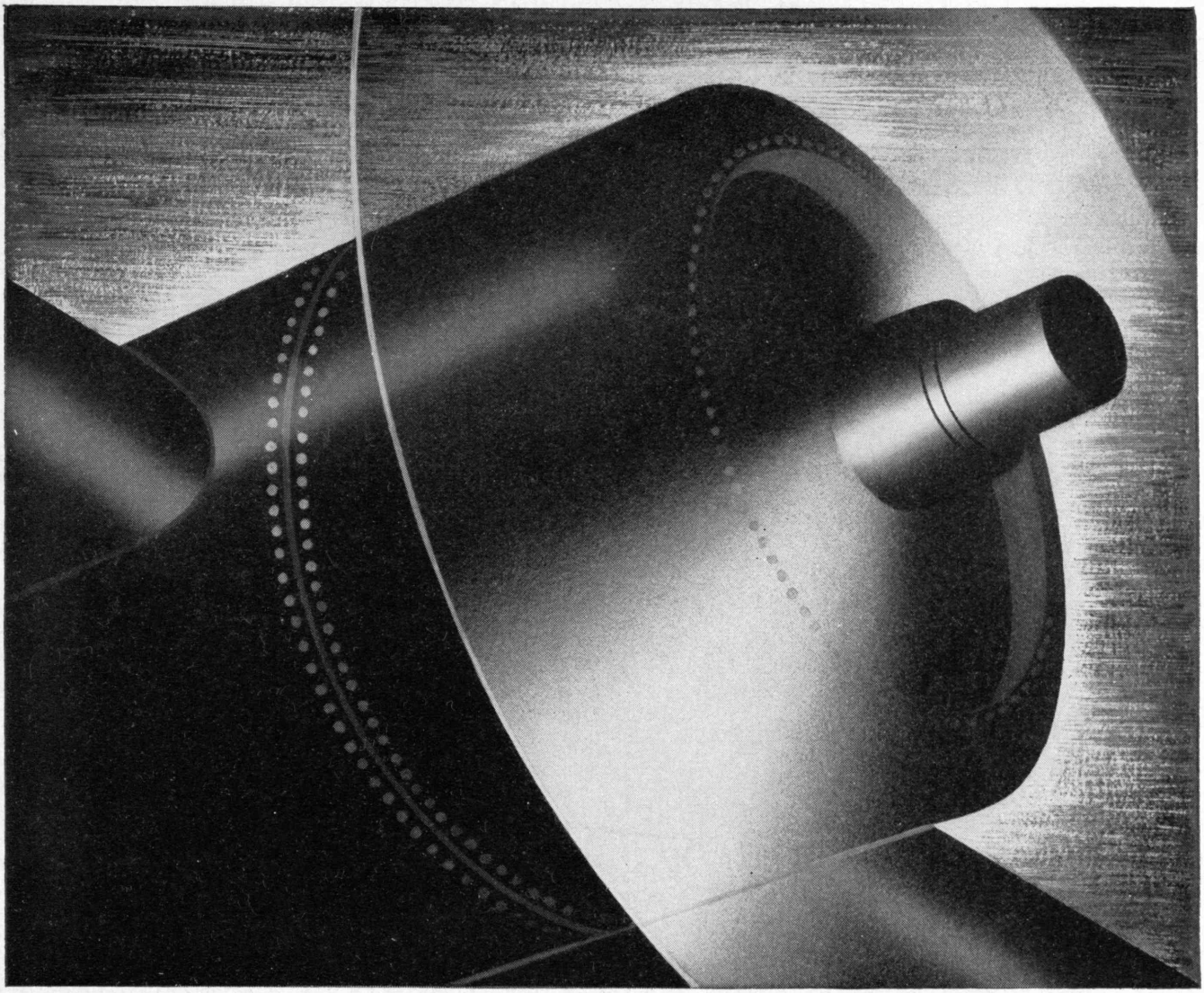
Imperfect Lubrication

When the load is too great, the speed or viscosity too low, the surfaces parallel, or the quantity of lubricant insufficient, a condition known as imperfect lubrication will be experienced, involving more or less metallic contact, followed by wear or seizure. These conditions have been investigated to some extent in connection with gear lubrication and have resulted in the development, by the petroleum industry, of E.P. (extreme pressure) lubricants. Such lubricants contain chemically active addition-agents which, in the language of Professor Buckingham, of the Institute's staff, have the character of an "anti-flux," and so prevent welding or seizure.

Even under conditions which are not sufficiently severe to produce any significant amount of wear, the friction may be influenced by some other property of the lubricant besides the viscosity, as ordinarily measured in bulk at atmospheric pressure. When two lubricants having the same viscosity, as ordinarily measured, give different coefficients of friction under identical test conditions, they are said to differ in *oiliness*. The lubricant giving the less friction is said to possess the greater oiliness.

High-Pressure Experiments

Many very interesting hypotheses have been put forward to explain the performance of lubricants under imperfect lubrication conditions. (*Continued on page 194*)



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CUTS COSTS CLIMAX Mo-lyb-den-um CREATES SALES

MOLY

THE OIL-SHED FALLACY

(*Continued from page 192*)

Whatever may prove to be the complete explanation, one simple factor that can hardly be ignored is the change in viscosity which occurs in the lubricant wherever the local pressure is sufficiently high.

The writer's first experiments on this subject, published in 1916, showed that a perceptible increase of viscosity would be caused by a very moderate pressure, the effect being less for lard oil than for a mineral oil of comparable viscosity. This work was begun in Professor Bridgman's laboratory at Harvard University. The investigation was subsequently taken up by Hyde at the National Physical Laboratory in Teddington, by Kiesskalt at Karlsruhe, by Kleinschmidt and others at Harvard, and by Suge at Tokyo.

More recent experiments by the writer, conducted at M.I.T. with Henry Shore, '24, have shown that the viscosity of lard oil, at 72 degrees F., is increased fourfold by the application of a pressure of 15,000 pounds per square inch; and that this oil solidifies, or becomes suddenly plastic, at about 21,000 pounds per square inch. A medium mineral oil of asphaltic base, at the pressure and temperature first mentioned, increased in viscosity six times as much as the lard oil, or about twenty-four fold. At 194 degrees F. it increased but without solidification, until at 60,000 pounds per square inch the viscosity of the mineral oil had gone up to approximately three hundred times its original value.

Rolling Friction

A complete program of friction research should include the study of rolling friction and dry-sliding friction, as well as the friction of lubricated surfaces. The laws of rolling friction apply to car wheels of every description, as well as to automobile tires and the mechanism of ball and roller bearings. The laws of dry-sliding friction apply to friction clutches and belting in factories, and obviously to brakes, a subject of rapidly increasing importance in view of the newer railroad developments.

An amusing experience in the testing of mine cars will illustrate the significance of rolling friction. A ball-bearing car was submitted by the bearing manufacturer in competition with two different types of roller-bearing cars. The friction should be less for the ball bearing than for any type of roller bearing, other factors assumed equal. To the surprise of everyone, the ball bearing car, No. 1, showed the highest friction of the lot, while one of the roller bearing cars, No. 2, gave almost double the friction expected. It was revealed upon inquiry that the ball bearing wheels had been unskillfully cast in a local iron foundry, and came out exceptionally rough. The wheel surfaces of car No. 2 had been turned down accurately in a lathe, thus eliminating the roughness, but removing the harder skin of the casting. The softer metal exposed created noticeably more rolling resistance, with the result that car No. 3, fitted with ordinary wheels, won the test. The true relative merits of the respective bearings were concealed by unnecessary differences in rolling friction between wheel and rail.

(*Continued on page 196*)

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(*Continued from page 194*)

Economics of Friction

A mechanical engineer in Pittsburgh was asked by the management of a steel mill to make a complete analysis of their power distribution and friction losses. His report was an eye-opener: from 40% to 50% of the power delivered to the rolls was consumed in the roll-neck bearings alone, with a total power loss of 90% for all the machinery in the mill. These conditions still exist in many large mills and factories in various industries but are being improved by the introduction of roller bearings and by scientifically designed plain bearings with oil film lubrication. Improvements are constantly being made in each type as the laws governing their mechanical action come to be better understood.

Every wheel that turns must overcome friction, from the smallest balance wheel of a wrist watch to the thrust bearings of a modern steamship or hydroelectric power plant. The total tax in energy so extracted amounts to a figure that no politician would venture to propose in terms of money; yet the law of the conservation of energy might be extended to read that all the industrial power converted into heat by friction is finally converted into an item of cost on the debit side of the ledger.

How to reduce the amount of this loss is one of the great problems of lubrication research. Other objectives are to lengthen the life of the bearing surfaces by minimizing wear, to avoid loss of time for repairs, and to economize space by reducing the area of the rubbing surfaces. Surprising results have already been accomplished. The modern pivoted shoe thrust bearings for propellor shafts occupy much less space than the older type, or multiple-collar bearings, and consume only one tenth as much power.

The economic significance of Newton's first law of motion is probably not fully appreciated by all engineers and industrial executives. Take, for example, railway transportation. How many people stop to think that if it were not for the air resistance, rolling friction and flange friction on the rails, bearing losses, and other forms of friction, no fuel would be required to maintain a given velocity on level track indefinitely? The popular assumption that velocity, as such, requires power is, of course, fallacious.

It is also interesting to remember that in a period of depression, friction losses account for a larger percentage of the power consumption than when running at full plant capacity. A vivid understanding of the principles governing power consumption provides a strong incentive to undertake further research on means for reducing friction.

Closing the Gap Between Research and Application

While there may have been some lack of understanding in the distant past between the infra-scientific and ultra-practical groups, there is every indication today that no such obstacle remains. Both groups are coöperating in the endeavor to meet half way. The recent lectures at the Institute were attended (*Concluded on page 198*)

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(*Concluded from page 196*)

by a surprising number of representatives of the practical art of lubricating, many of whom weathered the mathematics and remained to contribute helpfully.

A Survey Committee on Lubrication was appointed by the American Society of Mechanical Engineers about a year ago, to determine the present need of the industries with respect to research on lubrication. In their final report, this Committee approved and extended the program of the Special Research Committee on Lubrication, recommending as the most important problems: (1) hydrodynamic lubrication; (2) oiliness, wear, and seizure; (3) physical properties of lubricants; and (4) thermal problems of lubrication.

All that now appears necessary to close the gap between research and application is to go full steam ahead with the research.

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TREND OF AFFAIRS

(*Concluded from page 178*)

20,000 feet, he suggests consideration of some means for equalizing pressure. Army flyers using oxygen masks at altitudes of approximately 20,000 feet have found, however, that as long as they had sufficient oxygen they felt no discomfort from the decrease in atmospheric pressure.

It is interesting to note that the effects of low pressure and reduced oxygen supply indicated by nausea, headache, earache, or prostration, are immediate in some persons, while others feel them only after a return to normal pressure. The rarefied atmosphere from 14,000 to 16,000 feet causes some individuals to become abnormally irritable and quarrelsome, an effect which, strangely enough, usually appears several hours after exposure to the conditions which cause it.

The responses of the body in compensating for variations in atmospheric pressure have been cited by Dr. Morris Fishbein, editor of the *Journal* of the American Medical Association, as a subject of great interest. At high altitudes, he explains, there is an immediate contraction of the spleen, an effect which forces more blood cells from the spleen into the blood stream to assist in carrying the reduced supply of oxygen to the body tissues. Should the low pressure continue for a considerable period, the bone marrow joins the laboring spleen in its task, and the red blood cells are permanently increased in number, until the distribution of oxygen in the tissues and organs is balanced.

The Institute of Aeronautical Sciences, aware of the imperative need for thorough research and advice from the physiological point of view, has already taken steps to interest the commercial air lines and the Army and Navy air services in a comprehensive study of the entire problem.

FOR SHARPENING YOUR WITS

(*Continued from page 185*)

through which a body falls during t seconds under an acceleration g:

$$s = \tfrac{1}{2}\, gt^2.$$

Solve for t, obtaining: $t = \sqrt{\frac{2s}{g}}$.

We were told that when the time was half a second less, the space through which the rock had fallen was only half as great. Consequently, we have another equation:

$$t - \tfrac{1}{2} = \sqrt{\frac{s}{g}}.$$

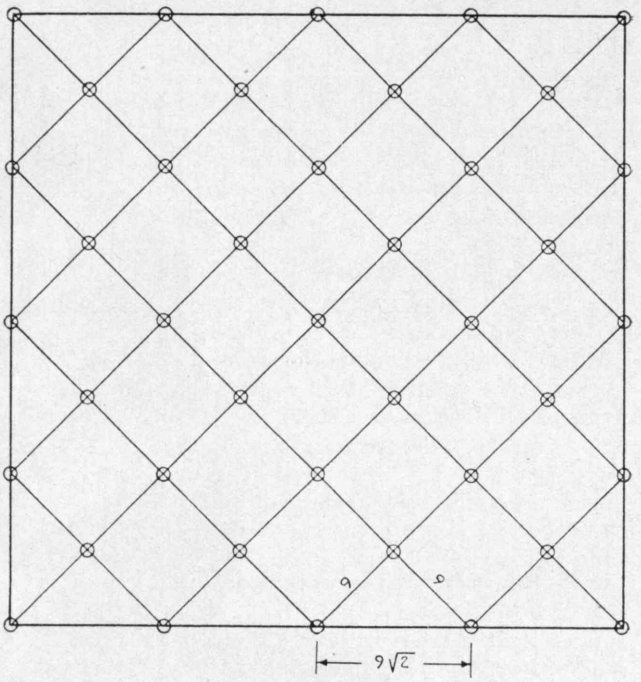

Fig. 1. Solution of the tree problem

Eliminating t from these last two equations and solving for s in terms of g, being careful to make no mistakes either in the algebra or the arithmetic, we obtain $s = 1.4571074\ g$. Now if g be taken as 32.2 to three figures, we get $s = 46.9$ to three figures. Thus, the man's roof was 47 feet high and he must have dropped his rock from a three- or four-story house.

The young farmer can get 41 trees on his square tract of land. Figure 1 shows how to do it. He should begin by marking off the two diagonals of the tract and planting a tree in the center, where they intersect. By drawing other lines parallel to the diagonals at distances of nine feet from each other (and from the diagonals, of course) he will form other intersections where trees may be planted. That there will be room for the 41 intersections in his plot is indicated by the dimensions given for the triangle at the bottom of Figure 1. To obtain this total it is necessary that the distance $9\sqrt{2}$ be contained four or more times in one side of the square plot. Since $4 \times 9\sqrt{2}$ is only 50.91, it is clear that 52 feet, two inches, along each side of the square will allow for this arrangement.

Other procedures do not allow so many trees: If the young man plants six rows of six each, he will have but 36 trees; if he plants a row of six along one edge, a row of five as near as possible to the first row, neighboring that, a row of six, and alternates thus across his lot, he will get only 39 trees.

The problem of the truck drivers and their midnight refreshment is an example of the fact that, while we cannot solve two equations for three unknowns, we may, nevertheless, sometimes solve them for some desired combination of the unknowns. By letting s, c, and d stand for the unit prices of sandwiches, coffee, and doughnuts, respectively, we can set up the following computation:

First truck driver's check, $4s + c + 10d = 85$.

Second truck driver's check, $3s+c+7d=70$.
Subtracting the second equation from the first and solving for s gives:

$$s=15-3d.$$

Substituting this value for s in the second truck driver's equation above and solving for c gives:

$$c=25+2d.$$

Now, the third truck driver's meal may be described thus:

$$s+c+d.$$

If, for the first two terms in this expression, we substitute the values obtained for s and c, we get:

$$(15-3d)+(25+2d)+d.$$

In this last expression the d's immediately cancel out, leaving 40 as the number of cents the third truck driver should have paid for his meal.

The fastest way to solve the problem about suburbanite Jones and his early trip home is to look at the matter from the standpoint of the chauffeur. He left the house at the usual time and was saved ten minutes on the round trip by going only part of the way to the station. Since he always drove at the same speed, this ten minute saving on the round trip must have come about by shortening the time by five minutes each way. He, therefore, drove to within five minutes of the station. Since his habit was to arrive at the station at five o'clock, he must have driven until five minutes of five. That means that Mr. Jones walked until five minutes of five. As he began walking at four o'clock, he walked 55 minutes. That's all there is to that.

The problem of the four tennis players is not quite so simple, even if you don't make any wasted motions. It turns out that the lawyer's name was Piff. The first set ended in a score of 6 to 4, which indicates that an even number of games was played in that set, and that the last game of the set was not served by the side which served first. This last game was lost by Piff (on his own service), so Piff was not the broker, for the broker's side served first. Since Riff bet the broker on the match and Biff lent the broker a racket, it is clear that neither of these two is the broker. If neither Piff, Riff, nor Biff is the broker, then Tiff must be. Since the broker's side served first and the other side lost the first set, the broker's side won the first set. From the final score of 6 to 4, 3 to 6, 6 to 4, we see that the broker's side lost the second set and, therefore, the first game of the third set was served by the broker's opponents. Since the advertising man served this game, he must have been the broker's opponent, and we were told that the lawyer was the broker's opponent. This leaves only the publisher to be the broker's partner. Since the first set went to Biff's side, Biff must be either the broker or his partner, and since Biff lent the broker a racket, he can't be the broker and must be the broker's partner, the publisher.

As Riff bet the broker on the match, he must have been the broker's opponent and must, therefore, have been either the advertising man or the lawyer. Since he was a better player than the lawyer, he must have been the advertising man. This leaves only Piff to be the lawyer.

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In the News

¶ CHARLES G. ABBOT '94, Secretary of the Smithsonian Institution, for demonstrating at the scientific exhibit of the American Association for the Advancement of Science the "most efficient apparatus so far developed by man for the direct conversion of the rays of the sun into useful mechanical energy."

¶ KATHARINE BLUNT '03, President of Connecticut College, for maintaining and strengthening the high place this institution has among women's colleges. Connecticut College is celebrating the anniversary of its founding 20 years ago this fall.

¶ MAX C. MASON '12, President of the Rockefeller Foundation since 1929, for giving up this position in order to devote himself more closely to research work in his own fields of mathematics and mathematical physics.

¶ KENNETH T. BAINBRIDGE '25 and Dr. Edward B. Jordan of Harvard, for reporting to the American Association for the Advancement of Science the interesting results obtained with their new mass-spectrograph. This device for weighing atoms yields additional evidence of the existence of the neutrino, which resembles the neutron in being without electrical charge, but is about 1,850 times lighter.

¶ SAMUEL SLOAN AUCHINCLOSS, Jr., '27 for designing a chromium-trimmed cubicle for sampling perfumes. An air-conditioning apparatus, combined with an electrical control, clears the air so that a new scent may be sampled without interference from that previously displayed.

¶ ERNST A. HAUSER, Staff, for forming a ski club at M.I.T. which will send teams to Dartmouth and Middlebury carnivals.

From the Platform

¶ By SAMUEL C. PRESCOTT '94, a paper entitled "History and Development of Sanitation and Disinfection," presented before the National Association of Insecticide and Disinfectant Manufacturers.

¶ By BURTON G. PHILBRICK '02, a talk on "Standards of Disinfectants," before the same group addressed by Dr. Prescott. This meeting took place at the Waldorf-Astoria in New York, December 9 and 10.

¶ By MICHAEL J. AHERN '06, the first of a series of talks on the general topic of religion and science in the 20th Century, January 4, 1936, under the sponsorship of the League of Catholic Women. Fr. Ahern stressed emphatically that religion and science are both concerned with facts and that there can be no conflict between them.

¶ By CARL J. TRAUERMAN '07, the story of the Little Rocky mining district, before the Northwest Mining Association in Spokane, early in December.

¶ By FLORENCE H. LUSCOMB '09, who has recently returned from the Soviet Union, on "Russia With My Own Two Eyes." This lecture was delivered on December 11 at Tremont Temple in Boston under the auspices of the Friends of the Soviet Union.

¶ By RICHARD D. FAY '17, on "Sailing Aboard the Yankee," addressed to the 5:15 Club at M.I.T. on December 16.

¶ By F. ALEXANDER MAGOUN '18, a lecture on "The Art of Human Relations," delivered before the Hampden County Women's Club in Springfield, January 14.

¶ By ERNEST H. HUNTRESS '20, one of the series under the auspices of the Society of Arts at M.I.T., "Explosives and Explosions."

¶ By JAMES A. PENNYPACKER '23, assistant to the president of the National Council of American Shipbuilders, on "The Modern Safety Trends in Shipbuilding." This address was delivered before the Sunday evening forum of the Flatbush Congregational Church, Brooklyn, N.Y., on December 1.

¶ By JAMES L. TRYON, Director of Admissions, a series of educational lectures and forums in more than 50 institutions. While making this six-weeks' tour through the South, Dr. Tryon visited a number of alumni clubs. Reports of these meetings may be found in the Club Notes section of this issue.

¶ By ERNST A. HAUSER, Staff, an after-dinner speech at a meeting of the Rhode Island Rubber Club, December 5, in which he suggested that the way to end Japanese competition in the world markets is to allow that country to develop Manchuria and China without interference from the Western world.

¶ By DONALD S. TUCKER, Staff, an address entitled "An Economist's Preview of 1936." This was delivered at the joint session of the Boston Chapter of the National Association of Cost Accountants with the Boston Management Council, on December 18. An interesting point of Professor Tucker's address was the statement: "It is to be hoped especially that the Townsend or other radical plan does not become an important issue. An even greater danger arises because conservatives may force the Republican party to adopt a program so reactionary that it will cause their defeat.

"A Democratic victory on such an issue would make it more difficult for the moderate Democrats to control the more radical elements which are temporarily associated with them."

The large volume of idle funds ready for investment, the stimulation of industry by Government spending, and the reappearance of business profits were taken by Professor Tucker as influences favoring recovery.

¶ By KARL T. COMPTON, President, a broadcast in Boston over station CBS-WABC, entitled "What's Next in Science?" on December 28.

On December 30, Dr. Compton broadcast another address, as retiring president of the American Association for the Advancement of Science, in which he advocated scientific research to end agricultural production control and dependence of industry on tariffs.

Written

¶ By FREDERICK C. GILBERT '98, "Montana's Share in United States' Silver Production," in *The Mines Magazine*, November, 1935. This article gives histories of the various important districts in Montana and ends with the forecast that: " . . . selective flotation of complex ores along with better understanding of the origin of ore deposits may be expected to play a large part in the future of silver production. . . . It is believed that not all the ore bodies in Montana have been discovered. . . ."

¶ By WARREN K. LEWIS '05, LOMBARD SQUIRES '31, and C. E. SANDERS '34 an article on "Evaporation of Lacquer Solvents," *Industrial and Engineering Chemistry*, December, 1935. Although it has been understood that constant-evaporating mixtures are not identical in composition with the constant-boiling mixtures of the same components, the writers felt that the problem was not fully answered by saying that the difference could be accounted for by change in composition of the constant-boiling mixture with the temperature. They have studied other relationships and their findings should be of help to lacquer compounders.

¶ By STUART J. SCHOFIELD '12 and I. M. Marshall, "Ore in Depth in British Columbia Mines," in *Canadian Mining and Metallurgical Bulletin No. 284*, December, 1935.

¶ By JAMES A. TOBEY '15 and Hugh Grant Rowell, M.D., "Need for Health Instruction in Cleanliness," published in the *American Journal of Public Health*, and *The Nation's Health*, November, 1935. This article is the result of a survey made in 404 schools in 22 states and the Dominion of Canada to determine the adequacy of lavatory facilities and their use among school children. The suggestion is made that the example set in the schools, rather than the verbal instruction given there, is a more potent influence and is an important factor in the ideas of cleanliness the child carries to his home.

¶ By ROBERT S. MOULTON '17, as general editor, the "Crosby-Fiske-Forster Handbook of Fire Protection." (Eighth Edition, 1935, 1184 pages.) Published in seven editions between 1896 and 1924, this Handbook is the leading reference work in the field of fire-protection engineering. The eighth edition is the first published under the auspices of the National Fire Protection Association of which Mr. Moulton is technical secretary and represents practically a complete rewriting of the former text. Mr. Moulton's work was done with the coöperation of a special committee of five members of the Association, of which C. W. MOWRY '06 was chairman and which included H. A. FISKE '91, one of the originators of the Handbook. Among more than 100 distinguished authorities contributing to the eighth edition are: E. V. FRENCH '89, GORHAM DANA '91, CLARENCE GOLDSMITH '98, WILLIAM G. BALL '05, A. H. NUCKOLLS '05, E. E. TURKINGTON '07, W. D. MILNE '08, R. E. WILSON '12, A. L. BROWN '13, H. A. SWEET '13, F. L. AHERN '14, N. J. THOMPSON '16, PERCY BUGBEE '20, H. L. BOND '23, and M. S. BLAKE '25.

¶ By J. W. MEADER '19, "A Formula for Determining Basic Values Underlying Common Stock Prices," in *The Annalist*, November 29, 1935. Based on a study of 502 industrial, railroad, and utility company "common stocks" traded on the New York Stock Exchange in 1933, data were compiled to show, among other things, that in the case of individual stocks "the important question of price is not to be answered accurately without advance estimates of earnings and dividend declarations." A formula was evolved to aid in the determination of these factors.

¶ By EDMUND T. ALLEN '23, "New Wings for a New Germany," in *Aviation*, December, 1935. This article, written as it was by an eye witness of conditions in Germany through the fact that he was sent to deliver a technical paper before the German Union for Aeronautical Development, has caused much interest in our country, and *News-Week* for December 21, 1935, carried a full reference with excerpts. Aviation specialists in this country have been awaiting news pertaining to the number and type of planes being produced in Germany. The answer: ". . . in Germany the Air Corps is not an adjunct of the army or of the navy, but is in fact the first line of defense. . . . The production rate of aircraft in Germany today lies between 3,000 and 4,000 units per year, practically all of military type. . . . Flying schools . . . are turning out trained pilot personnel at the rate of 2,500 to 3,000 men per year. . . ."

¶ By EUGENE R. SMOLEY '19 and WHEATON W. KRAFT '29, an article on "Production of Lubricating Oils," *Industrial and Engineering Chemistry*, December, 1935. Production of lubricating oils from crude oils, formerly thought unmarketable, has been increased by use of the solvent method. Mr. Smoley and Mr. Kraft have made a study of the separation of solvent and water in refining and dewaxing processes.

¶ By HOYT C. HOTTEL '24, a paper on radiant heat, one of a symposium of seven on this subject presented at the annual meeting of the American Society of Mechanical Engineers during the week of December 2.

¶ By V. C. SMITH '24, a paper at the same symposium of which Professor Hottel was a member.

¶ By MORROUGH P. O'BRIEN '25 and James E. Gosline, an article on "Velocity of Large Bubbles in Vertical Tubes," *Industrial and Engineering Chemistry*, December, 1935. We quote the summary given at the beginning of this article: "Experiments were performed on the motion of air bubbles in water and in two colorless petroleum oils using three sizes of glass tubing, the largest being six inches in diameter and 26 feet long. The size of the bubbles was above that for which Stokes' law is valid. Comparison of these results with other experiments shows reasonable agreement at a bubble radius of about three millimeters. Disagreement below this size is attributed to a condition similar to the transition from laminar to turbulent flow in pipes. As the radius is increased above this value, the effect of the walls of the tube becomes noticeable, and finally a limiting velocity is reached beyond which no increase results from an increase in the volume of the bubble. The present data indicate that the Gibson formula for this limiting velocity is slightly high for small tubes and low for large ones."

¶ By LU-CH'IANG WU '28, with an introduction by TENNEY L. DAVIS '13, a translation of the fourth and 16th chapters of "Pao-p'u-tzŭ," an ancient Chinese alchemical classic. This translation is entitled "Ko Hung on the Gold Medicine and on the Yellow and the White" and was published in the *Proceedings* of the American Academy of Arts and Sciences, Volume 70, Number 6, December, 1935.

Appointments and Elections

¶ GODFREY L. CABOT '81 and John H. Shobe, two of Boston's outstanding aviation leaders, appointed as delegates to the annual convention of the National Aeronautic Association in Washington on January 6 and 7. JEROME C. HUNSAKER '12, expert on lighter-than-air craft and Head of the Institute's Department of Mechanical Engineering was one of the alternates named for this convention.

¶ CARLE R. HAYWARD '04, reëlected president of the executive committee of the State Y.M.C.A. at a meeting held on December 12.

¶ MAURICE E. DENNY '08, elected president, for the ensuing year, of the Central Board of the Shipbuilding Employers' Federation in Edinburgh, Scotland, November 22.

¶ AUGUSTIN FRIGON '11, director of technical education of the province of Quebec and principal of the Polytechnic School at Montreal, made chairman of the Quebec Electricity Commission.

¶ PORTER ADAMS '14, President of Norwich University, made chairman of a new aviation committee of the New England Regional Planning Commission. This group is to study air traffic and plan for its growth.

¶ ROBERT E. WILSON '16, made director-at-large for 1936 through 1939 of the American Chemical Society.

¶ WILLIAM A. PEABODY '23, elected editor of the Virginia Section of the American Chemical Society for 1935 through 1936.

All Honor

¶ To CHARLES T. MAIN '76, recipient of the American Society of Mechanical Engineers Medal on December 3. The citation reads: "Charles T. Main — for his professional achievements in the textile and other industries and in engineering education; for his contributions to the literature on mill design, valuation of mill properties and water powers; for his eminent service and example to the engineering profession; and for his personality and character as evidenced by judiciousness, graciousness, and sincerity, which have endeared him to all who have been privileged to know him personally, as well as to those who have come to know and esteem him through his good works."

At the same meeting, Mr. Main was presented with the 50-year button in recognition of 50 years' membership in the Society.

¶ To ALFRED P. SLOAN, JR., '95, fêted at the annual dinner of the Poor Richard Club, Philadelphia advertising men's organization, and presented with the Club's gold medal. This medal is presented annually to "that citizen of the United States whose life and interests best typify advancement in the field to which the Club's purposes are dedicated."

¶ To CHARLES H. HERTY, JR., '21, for receiving, on December 7, the first Francis J. Clamer Medal for the most meritorious achievement in the field of metallurgy.

Noteworthy in the Class News

¶ We believe it would interest you to read of the unique gift made to M.I.T. by John Kittredge '94 (1894 notes) and to share Professor Turner's letter to Professor Charles E. Locke '96 (1917 notes).

DEATHS

* *See class notes for account.*

¶ FRANK H. BROWN '76, November 8.

¶ ALFRED C. KILHAM '76, November 28. Born in Beverly, Mass., the son of Austin D. and Susan C. Kilham, Alfred lived there until graduation from the Department of Mechanical Engineering. After leaving the Institute, he went to Springfield, Mo., where he made his home until his sudden death on Thanksgiving Day.

¶ EDWARD B. MARTIN '76, December 20.

¶ MARTIN GAY '77, November 23.

¶ ARTHUR W. WALKER '82, January 4, 1936. Born in Boston in 1861, the son of George Willis and Elizabeth Kinnicutt Walker, he received his preparatory education at the Chauncey Hall School. While at the Institute he was the first editor of *The Tech*. Mr. Walker was a partner in the Walker and Pratt Manufacturing Company and, in addition, had many interests: He was a former vice-president of the First National Bank of Malden and trustee of the Malden Savings Bank; he served as a member of the Malden school committee for several years and at one time was its chairman; he was a former president of the Malden Hospital, the Malden Y.M.C.A., and was a member of the First Congregational Church; he was senior past president of the American Foundry Men's Association and a past president of the New England Stove Association.

Within the year, two other original promoters of *The Tech* have died: Arthur D. Little '85 and I. W. Litchfield '85.

¶ JONATHAN E. WOODBRIDGE '93, December 23. Woodbridge went to San Francisco in 1907 to rehabilitate the power stations of the United Railways for Ford, Bacon and Davis, and remained the local representative of that firm. He helped to build the generating and transmission systems of the Sierra and San Francisco Power Company. He maintained a constant interest in the Institute and was for years president of the M.I.T. Club of Northern California. He was active in professional and civic affairs and was president of the Engineers Club of San Francisco, 1920 to 1921, and a member of the American Institute of Electrical Engineers and of the Commonwealth Club of California.

His death occurred at the Mills Memorial Hospital in San Mateo, Calif. Surviving him are his widow, Katherine A., a daughter, Mildred Ethel, and a son, Jack E., Jr.

¶ EDWARD H. HUXLEY '95, December 11.*

¶ JAMES S. SMYSER '96, December 15.*

¶ DWIGHT CLARK '97, December 26. Greatly interested in fine arts, Dwight was treasurer of the Phillips Memorial Gallery and the American Federation of Arts. He belonged to numerous patriotic societies, including the Society of the Cincinnati, the Society of Founders and Patriots, and the Colonial Wars Society. His clubs included the Metropolitan and Chevy Chase in Washington, the Union League and Century in New York, and the Duquesne in Pittsburgh. At the time of his death Dwight was director of the Jones and Laughlin Steel Corporation and of the Phillips Properties, Inc., of Washington. Mrs. Clark survives.

¶ HERBERT M. FLANDERS '00, December 7.

¶ WILLIAM L. HEARNE '00, June 18.

¶ CHARLES F. F. CAMPBELL '01, December 28. We quote from the Boston *Transcript:* "Campbell was born in London, the son of Sir Joseph Francis Campbell, an American who was knighted for his services to the blind. He was reared among blind children in the Royal Normal College and Academy for Music for the blind, an institution his father founded. — In 1903 Campbell became secretary of the Massachusetts Association for the Blind. Subsequently he founded a magazine, *The Outlook for the Blind*, and served as its editor without pay for 16 years. — He was secretary of the Pennsylvania, and later the Ohio, commission for the blind and during the World War served as assistant director of the Red Cross Institute, working for the rehabilitation of blind veterans. Since 1922 he had carried on his work here [Detroit]. . . . Mr. Campbell took courses in pedagogy at Leipzig, following his graduation from M.I.T." Death occurred suddenly as the result of a heart attack.

¶ CHARLES W. HAWKES '05, December 12.*

¶ WALLACE R. HALL '06, December 18.

¶ THEODORE C. HARRIS '23, November 3.

¶ LOUIS H. FITCH, JR., '27, December 11. Louis was born in Newton Centre and attended Phillips Andover Academy. He was a member of the Naval Reserve Aviation Corps and for some years had been a chemist in the patent offices of the Phillips Petroleum Company at Bartlesville, Okla.

NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

Technology Club of New Hampshire

The annual meeting of the Club was held at the Hotel Carpenter, Manchester, on Thursday, November 7, with a total attendance of 40 Technology men, one Technology woman, and two guests. President F. E. Everett '00 acted as toastmaster and called first on John C. Chase '74, as the oldest Alumnus present, for remarks, to which request he responded in his usual cheerful manner.

The Cambridge delegation consisted of Dr. Bush '16, Vice-President of the Institute, Professor Moreland '07, President of the Alumni Association and the new head of the Electrical Engineering Department, Professor Locke '96, Secretary of the Alumni Association, J. Rhyne Killian, Jr., '26, Editor of The Review, and H. E. Lobdell '17, Dean of Students. Our Club is deeply indebted to these gentlemen for the time and energy they gave us and particularly to Professor Locke for getting up the party.

The speeches were started by Dean Lobdell who took as his subject, "Student Finances." He informed us that the demand for loans was decreasing and that 71% of all loans had been paid — a very good record. Editor Killian spoke of alumni activities, stressing lost addresses and asking assistance in remedying this difficulty. Professor Locke's topic was "All-Technology Reunion — Shall It Be Had on Monday or Saturday?" He asked that this be considered a real, rather than rhetorical, question as assistance is needed for its decision. Professor Moreland asked: "How Can the Alumni Association Help the Institute?" His answer was: "By sending good raw material to Tech." He also spoke of the close coöperation between the various departments, and asked particularly for assistance for the library. Dr. Bush advised that the Technology budget was balanced, equipment added to and kept up to date, and a new field house added — all this in spite of the depression. He stressed the value of outside contacts with industry and made the cheering statement that "Technology is still an undergraduate college." Technology should strive for quality rather than quantity and also try to stabilize enrollment.

The election of officers resulted as follows: President, Arthur O. Roberts '04, Manchester; Vice-President, Walter D. Davol '06, Manchester; Vice-President, Guy A. Swenson '12, Concord; Vice-President, Charles Rich '26, Nashua; Secretary-Treasurer, Malcolm C. Mackenzie '14, Derry; Representative, J. Warren Horton '14, Cambridge. Interest in the Club is growing and it was decided to have the next meeting soon at some country club on a Saturday, with golf in the afternoon and dinner in the evening.

Those present were as follows: Atherton '24, Bartlett '85, Bean '94, Bjurling '30, Bowler '14, Bush '16, Chandler '16, Chase '74, Clough '91, Daniell '97, Davol '06, Emerson '27, Everett '00, Faunce '34, Foster '30, C. A. Hall '08, L. S. Hall '14, Holden '99, Miss Holden '31, Holmgren '19, Killian '26, Langley '19, Letourneau '27, Lobdell '17, Locke '96, Mackenzie '14, Magenau '34, Moreland '07, Mosscrop '20, Murphy '34, Nutting '19, C. Rich '26, J. Rich '30, Roberts '04, Smith '11, Swenson '12, Swift '15, Thompson '05, Waymouth '16, Whitney '23, Wilson '31, Shedd, guest, Campbell, guest. — MALCOLM C. MACKENZIE '14, *Secretary*, The Benjamin Chase Company, Derry Village, N. H.

Technology Club of Panama

The days are lovely now, clear and fair, but for three or four weeks, starting the early part of November and continuing into the first week of December, we had constant rain. According to local papers the floods over the Madden Lake and Gatun Lake watersheds were the greatest recorded since the American occupation of the Canal Zone. It rained, and rained, and rained, day and night, a continuous, torrential downpour, sometimes so terrifically heavy that it was startling. Everything got wet: clothes were soaked; sheets and blankets, damp and soggy; shoes became mildewed; housekeepers couldn't get their ironing done because the laundry wouldn't dry out. Now a cool breeze is blowing and we are having pleasant, comfortable weather again. Golfers are taking advantage of the good weather and soon the interclub matches will start.

Major William E. R. Covell '23, Corps of Engineers, assistant engineer of maintenance of the Panama Canal, has been ordered to duty at Pittsburgh upon the completion of his tour of duty here. Major Covell has been stationed here since 1933. In Pittsburgh he will be district engineer. — The Club gave a dinner at the Century Club on December 14 in honor of the Major. Twenty-two Technology men were present: Major Covell '23, William H. Beers '05, Austin W. Brooks '11, Meade Bolton '16, Isbell F. McIlhenny '23, James Merriman Lynch '25, Lewis B. Moore '26, Edward G. Cowen, Jr., '27, Walter A. Key '29, Edmund L. Koperski '30, Manuel P. Calderon '30, Edward M. J. Pease '31, Antonio J. Sucre '31, Jose B. Calvo '33, Temistocles Diaz '33, Kenneth F. Ryder '34, Earl K. Murphy '34, Constant W. Chase, Jr., '34, Malcolm S. Stevens '34, Donald C. Gutleben '35, George C. Dunlap '35, and Richard R. Brown '35.

Major Covell leaves the Isthmus on January 17 for a three-and-a-half months' tour around the world and will visit such romantic places as Honolulu, Yokohama, Kobe, Shanghai, Hongkong, Manila, Singapore, Padang, Colombo, passing through the Suez Canal, Cairo, and Gibraltar. He is due to reach New York on the 5th of May after a truly grand and glorious vacation.

Major W. D. Styer '22, now stationed at Pittsburgh, will succeed Major Covell as assistant engineer of maintenance at the Panama Canal and is due to sail from New York for the Canal Zone early in June.

I always thought of the Panama Canal as "The Canal," but I noticed that Granberg, the general secretary of the Class of 1935, in the November number of The Review refers to the Cape Cod Canal as "The Canal." Perhaps we should refer to the Panama Canal as "the Big Ditch," a term used by the "Old Timer."

Dunlap '35 and Mal Stevens '34 gave me the dope for notes which follow: James P. Eder '34 has left the Isthmus. Some time in September while on vacation, he secured a position with the American Radiator Company, New York. So, much to our regret, he resigned his position as assistant to the mechanical supervisor, commissary division, the Panama Canal. Looks as if we will have to cut out the leave for these promising young fellows if we wish to keep them with us. Jim left here the early part of October on the S.S. *Santa Monica* for Buenaventura, Colombia. He spent a month or more in the interior of Colombia, inspecting, among other things, a large sugar plantation and brick factory. On his way to New York he came back through the Canal on the S.S. *Santa Clara* on November 13, and was ashore here for a few hours — long enough, at any rate, to cause quite a local disturbance. The gang he'd been running around with, Dick Brown '35, Mal Stevens '34, Ken Ryder '34, and others, gave a wild, impromptu, farewell dinner in his honor. Jim's quite popular round these parts; rumor hath it that a couple of Canal Zone girls spent the entire day he was here, telephoning and frantically driving around in vain attempt to catch up with him and tie him down, persuade him, or otherwise gently force him, so they say, to remain on the Isthmus. I can imagine that it's bad enough to have one girl after you — but, two, ye gods! Well, he's gone now, escaped safely, and let's hope broken hearts will mend.

Speaking of vacation — Mal Stevens was on vacation with Jim, and from Mal I have it that they had a real vacation. They left here in August, sailed to California, and for three weeks zigzagged across the country — some 5,500 miles — visiting Yosemite, Sequoia National

Park, Los Angeles, Death Valley, Las Vegas, Nev., Boulder Dam, Zion Canyon, Grand Canyon, Salt Lake City, Yellowstone National Park, Denver, and then, traveled through Kansas, Missouri, Kentucky, and the Virginias to Washington, New York, Boston, and their respective homes. Home means Stormville, N. Y., for Jim Eder, and Methuen, Mass., for Mal Stevens. These two apparently didn't want to travel any farther together, for Jim returned to the Isthmus on a Dollar Line steamer while Mal chose the Panama Pacific liner, *California*. On the *California*, Mal found Earl Murphy '34 and Ken Ryder '34, also returning from leave. They stopped at Havana for a day and on the 11th of October the trip through the Canal brought their vacations to a fitting close.

Jack Carey '34 spent his leave somewhere in the vicinity of Boston. He left here on the Panama Railroad steamer *Ancon* on November 4. A farewell party was arranged for him, the Sunday before he left, by the '34 and '35 M.I.T. Classes represented here. Twenty-five couples had an all-day picnic at La Venta Beach, a beautiful white sandy beach about 75 miles from the Canal.

After a vacation in Europe during which he visited London, Brussels, Antwerp, Amsterdam, Schaffhausen on the Upper Rhine, and Basel, Meade Bolton '16 has returned to the Isthmus.

Constant W. Chase '34, otherwise known as Connie, celebrated the completion of his first year's work on the Isthmus by getting married. Miss Frederica Olsson of Belmont, Mass., and Mr. C. W. Chase were joined in holy matrimony in Cristobal on the Fourth of July. Connie has further reasons for celebrating — he got a raise. No longer is he a lowly recorder, he is a meter tester now, with a substantial raise in pay.

Ken Ryder '34 and Earl Murphy '34 spent their vacation during August and September in Boston. They traveled the round trip together on the Panama Pacific liner *California* by way of Havana. I understand that these two fellows have been together since high-school days and, what is more remarkable, they are still on speaking terms. Mal Stevens says that they know so many stories about each other that they stick together rather than risk exposure by the other guy.

Robert Stewart Burdick '33, U.S.N.A. '35, ensign U.S.N., and grandson of Professor C. E. Locke '96, is on the U.S.S. *Houston*. When the President took his vacation trip on the *Houston*, sailing from California, down the West Coast, visiting romantic Cocos Islands and the Pearl Islands, fishing and catching tarpon, sailfish, and other giant fish which abound in these tropical waters, Bob Burdick was aboard as one of the junior officers. The *Houston* passed through the Canal on the 16th of October.

On the return trip through the Canal, November 18, the *Houston* tied up at Balboa and I received a phone message that a grandson of Professor Locke would like to see me. I went down to the dock and met Burdick. Later I had the pleasure of taking him and his friend, Frank Barrows, who carefully explained that he was not a Tech man, for a drive to the Madden Dam, passing through Balboa, Panama, out Gaillard Highway, through Pedro Miguel, past Gold Hill, out the Madden Dam Road winding through virgin jungle, crossing Cruces Trail, the famous Gold Trail across the Isthmus. Because of recent heavy rains the lake formed by the dam was very high and a tremendous volume of water was spilling over the dam — a gorgeous sight not seen by many tourists. It was an interesting and wonderful trip and I hope that both Burdick and his friend enjoyed it also. I will never cease to wonder how it is that Professor Locke has a grown up grandson; I didn't think he was old enough. — MEADE BOLTON '16, *President*, Box 23, Balboa Heights, Canal Zone.

M.I.T. Club of Akron

The Club held a most enjoyable meeting at the University Club on Friday, November 22. After an excellent dinner, chairs were faced around to witness two movies. The first of these was of a transcontinental air flight and was furnished by the Cleveland office of the United Air Lines. The second was the Edgerton high-speed film, kindly forwarded from the Institute through our good friend, C. E. Locke '96. Both movies were very enjoyable, but it was the Edgerton film, with its technical background and its truly remarkable slow motion, that really aroused the interest of the crowd. There was considerable round-table discussion at its conclusion. The 42 members present apparently felt the meeting was one of the best we have ever had. We heartily recommend the Edgerton film to other alumni clubs which have not seen it. The evening ended with the usual fraternizing and card playing.

Plans are being made for a dance about January 31. — JAMES B. HOLDEN '30, *Secretary*, 276 Sundale Road, Akron, Ohio.

M.I.T. Club of Western Pennsylvania

At our regular monthly meeting at the University Club on Tuesday, December 17, we saw the Edgerton high-speed movie. This film, showing action pictures in slow motion, proved most interesting. — At our next meeting we are promised a most interesting lecture with colored slides on Boulder Dam, by Mr. R. A. Kirkpatrick of the Union Pacific System. — E. J. CASSELMAN '15, *Secretary*, Mellon Institute, University of Pittsburgh, Pittsburgh, Pa. E. A. SOARS '21, *Assistant Secretary*, Townsend Company, New Brighton, Pa.

M.I.T. Alumni Association of Nashville

The following report was supplied by Donald W. Southgate '11: We had a good meeting with Dr. Tryon when he was in Nashville on November 24. There were 10 men present and the evening was a delightful one indeed. We had an old grad on hand in the person of Benjamin F. Wilson '89, and it was interesting to have reminiscences dating back beyond any we had previously been able to conjure up. Dr. Tryon makes a delightful guest, and it was good to have one with us who had been here before. We remember so pleasantly his visit of 1929 and we had a lot of fun talking about the 12 inches of snow which greeted us out of doors after that meeting. It was something rather unusual here, particularly as late as March, when the meeting was held.

Donald Southgate resigned his chairmanship of the association, stating that he felt that someone else ought to step in after he had held the office for 10 or 12 years, and he suggested that some new life might be injected into the Club by a change. Consequently, Ira P. Jones '21 was elected to the presidency and James F. Muhlig '98 was reëlected as secretary. — JAMES F. MUHLIG '98, *Secretary*, 1300 Riverside Road, Old Hickory, Tenn.

Worcester County Alumni Association of M.I.T.

The fall meeting of the Association was held in the Hotel Bancroft on Wednesday evening, December 11. Professor Armstrong and Professor Locke '96 gave very interesting talks which were enjoyed by all present. The meeting was the largest for some time, the attendance being 62. In addition to the regular program, the Southbridge contingent presented an amateur hour which livened up the proceedings and furnished amusement for every one. — It was regretted that John Swift '27, President of the Association, recently lost his father and, therefore, could not be present.

In addition to the two guests of the evening, the following Alumni attended: James N. Andreson '25, Jacob Berkover '30, Gordon W. Browne '29, Percy J. Colvin '07, F. Harold Daniels '11, Orville B. Denison '11, Edward Depoyan '31, Daniel P. Dyer, Jr., '32, Carl T. Guething '16, Robert N. C. Hessel '27, Albert S. Heywood '92, Peter J. Jerardi '27, A. E. Jorjorian '31, Arthur J. Lariviere '35, Harry M. Latham '93, Charles H. Lusk '23, George D. Manter '31, Oscar T. Marzke '32, Norman C. Nelson '31, Leonard C. Peskin '29, J. Weston Pratt '24, Rufus A. Soule '34, Howard R. Stewart '17, John L. Tufts '99, Lewis S. Vose '16, and Ernest P. Whitehead '20 — all of Worcester; Howard F. Atwood '32 of Bolton; A. M. Altieri '29, Charles E. Cashman, Jr., '33, Wallace S. Crowell '32, Fiske R. Jones '15, and Andrew B. Sherman '06 of Fitchburg; Harold O. Berry '22, Stanford H. Hartshorn '11, Ludwig P. Jandris '31, Thomas P. Kelly '18, Winthrop E. Luke '21, and Roger R. Smith '27 of Gardner; Maurice C. Beren '28, Robert H. Brown '22, Edward Earl '91, George W. Falk '32, Herbert L. Hayden '23, and Robert J. Proctor '28 of Leominster; Herbert A. Bryant '00, A. A. Gordon, 3d, '23, and Edgar W. Norton '98 of Shrewsbury; Arthur G. Anderson '30,

W. Franklin Baxter, Jr., '34, Cassius C. Belden '34, Alanson G. Bowen '33, George J. Brady '32, Gale Forssen '35, H. William McKeague '34, Frederic I. Miner '32, John E. Perry '34, E. A. Teeson '15, and C. Samuel Woodruff '31 of Southbridge; Charles E. Allen '07 of Spencer; Carl H. Wilson '34 of Webster. — E. A. TEESON '15, *Secretary*, American Optical Company, Southbridge, Mass.

Technology Club of Central Florida

In conjunction with the visit of Dr. James L. Tryon to Tampa, the Club called a meeting for the evening of December 5 at the El Pasaje restaurant in Tampa, where a Spanish dinner was served. The meeting was conducted as an informal discussion, and Dr. Tryon's first-hand information concerning the problems and affairs of the Institute was of interest to everyone present.

The following members attended the meeting: A. C. Nichols '08, accompanied by his son, W. N. Munroe '06, J. M. Kohr '35, F. D. Mendenhall '14, W. B. Newell '17, W. H. Leathers '03, L. P. Geer '15, F. O. Adams '07, M. J. Mackler '17, H. M. Mansfield '83, M. R. McKinley '19. — MALCOLM R. MCKINLEY '19, *Secretary*, Tampa Electric Company, Tampa, Fla.

Technology Club of Lower Ontario

The last dinner meeting of the year was held by the Club on November 26 at the Granite Club of Toronto. Since the reorganization of the Club early in the year, the officers had been endeavoring to secure a representative from the Institute to attend one of their meetings. We were finally successful, through Professor Locke '96, in having as our guest speaker for this meeting, Professor Whitman '17, head of the Chemical Engineering Department, who was making a special visit to the Practice School at Buffalo and arranged a detour to include Toronto on his way back to Cambridge. Unfortunately, as we had only a few days in which to organize the meeting, a great many of our members were out of the city or had made other definite engagements. However, the meeting was a most enthusiastic and interesting one, and Professor Whitman was able to carry on a round-table discussion on many things connected with Institute affairs.

We can now appreciate how much value it is to our members to have a Technology representative visit us occasionally, to bring us up to date on what wonderful progress is being made at the Institute. Professor Whitman was voted a "splendid success" at the meeting and a "very human personality"; we hope he comes again. Dr. Gledhill, the president, introduced the speaker and also moved a vote of thanks, which was seconded by John S. Keenan. Mr. Keenan commented on the set up of the practice schools which was explained by Professor Whitman and on his experiences at the General Electric Company as part of the coöperative course he started, but from which he later transferred to the regular course at the Institute.

The minutes of the last meeting were read and accepted. A list of all Technology men in the area of our Club has been prepared and mailed to each of these men. Although there are 78 Technology men in this territory, only about 35 are within easy reach of Toronto. A letter of regret was received from Clarence D. Howe '07 of Port Arthur noting his inability to be present. In the recent Dominion election he became a member of the new Liberal government and has been honored with the cabinet position of minister of railways and canals. — To assist the Alumni Athletic Fund it was voted to remit $5.00. The meeting was then adjourned.

Those present were: John Buss '26, Charles W. Sampson '29, Albert D. King '32, Harry S. Chandler '08, Thomas L. Gledhill '26, G. Ross Lord '32, John S. Keenan '23, Valentine W. G. Wilson '28, Louis B. Black '14, David S. Johnston '26, A. R. Holmes '00, Bernard H. Morash '12, and Walter G. Whitman '17. — BERNARD H. MORASH '12, *Secretary*, Room 501, 137 Wellington Street West, Toronto, Ont., Canada.

M.I.T. Club of East Tennessee

A very successful meeting was held in Knoxville on the evening of November 22, at which 37 former students were present, representing the following cities: Knoxville, Kingsport, Elizabethton, Jefferson City, Norris, Harriman, and Rockwood. Several men, including one in Chattanooga, wrote that they would be unable to attend, but welcomed the forming of a local club.

Our guest, Dr. James L. Tryon, gave a most interesting talk and showed the Technology movies, which took us all back to Tech, and we are indeed grateful to him. We shall look forward to other visitors from the Institute from time to time.

At this meeting, we organized a permanent club, adopted a constitution, and elected the following executive committee: Erwin Harsch '20, President; Frederick A. Dale '14, Vice-President; Joseph C. Nowell, Jr., '23, Treasurer; Albert S. Peet '09, Secretary; Dana M. Wood '06, member. The annual meeting shall be held during the month of April and other meetings shall be held at such time as is decided by the executive committee.

There are about 60 former students now residing in East Tennessee and from all indications we should have a most active club. — ALBERT S. PEET '09, *Secretary*, Knoxville Glove Company, Knoxville, Tenn.

CLASS NOTES

1888

One of the largest dinners ever held in Boston was that recently held at the Statler to celebrate the 30th anniversary of the founding of the Boys' Clubs of Boston. Seventeen hundred were expected and 2,300 actually sat down to dinner. Tables were set everywhere — on the stage, in the boxes, and over 100 in the *foyer*. You will not wonder at this great success when you know that the program chairman was none other than our classmate, Edwin S. Webster, a member of the Board of Overseers. He was assisted on the dinner committee by Arthur Conner, John Runkle, Alfred Sawyer, and Sanford Thompson. As an added attraction, J. Edgar Hoover, chief of the G-men, made the principal speech. All of the "socialites" were present, including Mrs. Edwin S. Webster, attractive in a long chinchilla wrap and slim gown of *crêpe*, as blue as a forget-me-not, with two exquisite white and yellow orchids.

Nancy Rich is the name of Arthur Conner's first grandchild, born on November 3. Your Secretary became a grandfather for the second time on September 1, when Eldon Cunningham Mayer, Jr., started on his career toward an admiral in the United States Navy. He was born at Annapolis, his father being an instructor in marine engineering at the Naval Academy.

Fred R. Nichols has retired at the age of 70, after teaching for 43 years in Chicago. He was tendered a big birthday party at the Gladstone Hotel, at which 91 people were present, and later a banquet at the Union League Club, where there were 11 speakers. Although his health is as good as ever, the doctor ordered him to go to Florida every winter and play golf. We ought to have more doctors in Boston like that. He planned to spend this last summer in South Acworth, N. H., his birthplace, but we will let him tell it: "We had set the day for the start as Wednesday, July 10. On Saturday, July 6, while driving alone I smashed into a post and woke up in a hospital. No bones broken, just a bad cut around my left knee without injuring the joint at all. My car was smashed. The anticipated rest in the country had gone up in smoke, but I did get the rest just the same — in bed for five weeks — and *I did rest*. I wasted not a minute in worrying. I just made the best of a bad bargain, and everybody congratulates me on my healthy appearance."

The Secretary will answer Ben Buttolph's recent letter, as other classmates may be interested, by saying that the committee (J. C. T. and B. R. T.) selected the cup for the Class Baby, Winslow Blanchard's son, paid out the $26.00 for it — all the money in the Treasury — and gave it to Blanchard. The theater party in '89, as I remember it, was at the Hollis Street Theater to see Julia Marlowe as the Greek Maiden in "The Barbarian." Thank you Ben for saying that you think our column in The Review is "better than Walter Winchell's or Neal O'Hara's," but please remember it is the "men of '88" who make our class notes interesting, not the Secretary. — BERTRAND R. T. COLLINS, *Secretary*, 52 Garden Street, Cambridge, Mass.

1890

The Hayden Planetarium, Charlie Hayden's fine gift to New York City, has been much in the news lately. It was reported around Christmas that by its use it had been shown that three of the planets may have been so close together as to look like one star around the time of the birth of Christ.

Willard Tilson, who for many years was with the big wholesale dry-goods house of Bliss Fabyan and Company as credit manager, cashier, and assistant treasurer, has retired from active business, and his mail now goes to his home at 190 Clifton Street, Malden. However, we need not worry about his rusting out. He is still going strong, and putting in his time helping the world along as treasurer of the Good Will House Association and of the First Congregational Church of Malden. The latter has just completed a fine new building. — GEORGE L. GILMORE, *Secretary*, 57 Hancock Street, Lexington, Mass. GEORGE A. PACKARD, *Assistant Secretary*, 50 Congress Street, Boston, Mass.

1894

Many matters have conspired to prevent the Secretary from reporting in recent issues as he should have done. It was his intention to have some notes in the December number of The Review, but just at the time they should have been written the Secretary was submerged in the intricacies of a law suit. He hastens to state that he was not a principal in this affair, but had been engaged for several months as a so-called expert. The case was an interesting one involving some biological problems and was concerned with some German patents. It was on this business that the Secretary made a hasty trip to Berlin in the spring.

Leaving Boston on April 27, he went by the S.S. *Europa* to Cherbourg, thence by train to Paris, and after six hours in that city, on to Berlin where he spent ten days. It was interesting to revisit the latter after an absence of 35 years and to see how it had developed into a great modern city which reminded one of certain parts of Chicago more than it did of the typical German city as we ordinarily think of it. It was interesting also to see the things taking place in the great German capital. Conscription had just been ordered and there were large numbers of young men in uniform marching through the city and going to the training fields for their military drill. There was enormous activity at the Tempelhof Airport. It was interesting also to observe the construction of the new subway which is to go the whole length of Unter den Linden, thence under the Tiergarten, and on to the location outside the city where the Olympic games will be held next summer. — On the return trip, the Secretary flew from Berlin to London, doing in four-and-a-half hours what would have required more than 24 hours by train and boat. Eight days after arriving in London, he was again at his desk.

The law suit, which involved infringement proceedings, was supposed to have been entirely over before the first of October, but with the usual delays which are encountered in such cases, it did not come to trial until October 10 and for the next three weeks the Secretary commuted between New York and Boston, thus being able to keep up his class work and other official engagements here and, at the same time, attend most of the sessions of the Court in Newark. In those days, however, the preparation of notes for The Review was unfortunately neglected.

Among the outstanding undergraduate interests at the Institute this autumn is a keen enthusiasm for sailing small boats expressed by several hundred students. Already a fleet of dinghies has been given to the new society which is sponsoring sailing by generous Alumni and friends. George Owen has been extremely active in this development and has been giving lectures on the theory of sailing to large numbers of students who are willing to take an hour, after the regular work of the day is over, to secure this instruction. When we all return for the Alumni Day next June, we shall probably see at least a score of small boats sailing about the Basin, and such activity will doubtless prove to the visiting Alumni, as well as to the populace of Greater Boston, that Technology students are not killed by overwork, but manage to find time to enjoy interesting and healthy sports.

John Kittredge, who now lives at Sunnyside, L. I., and who will be remembered by all the Class as having come from Colorado, has recently made a unique and historic gift to the Institute. This is best explained in an excerpt from a letter from John to George Haven which is quoted here: "White men went first to Colorado in 1859, and in that year the 40th parallel of north latitude, which was the boundary line between Kansas and Nebraska, was surveyed and the corners of those states extended to the top of the mountains. Colorado had not yet been segregated as a territory. From 1898 on for several years my work as a surveyor was in that vicinity and I had to do with many of the corners on that original base line. I have heard that a troop of cavalry accompanied those first surveyors to guard them from the Indians, but I have not that officially.

"Now in timber country, survey corners are 'witnessed' by 'bearing trees'; distance and bearing are recorded from the corner to the tree and the tree is blazed and numbers cut into it indicating the corner it witnesses. In the 40 years from '59 to my coming onto the scene, many of the trees had fallen and rotted; but some of them were still living and had 40 years of growth since they were blazed and scribed. In that time, the wood had grown completely over the blaze, though the new wood remained separate from the old. Chopping around, one could take off the slab and expose the old blaze and numbers as plain as the day they were cut. On the slab would be the numbers reversed, like print and type, raised, where the new wood grew into the grooves of the original numbers.

"Now, I have several of these slabs. It occurs to me that the Institute — its Civil Engineering Department — may like to have them. Will you please find out for me, and if they would like them, tell me to whom to send them?"

Several new addresses have come to the attention of the Secretary: Frank H. Holden is now located at 56 West 45th Street, New York City; Thomas I. Chapman, who has been missing for a number of years, is at 132 Sociego, Manila, P. I.; Mrs. George S. Whiteside has moved to 1212 Fifth Avenue, New York City; William L. Woollett is at 5330 Loma Linda Drive, Los Angeles, Calif.; Jim Kimberly, having practically retired from business as an administrative officer of the Kimberly-Clark Company of Neenah, Wis., is now making his home at Tryon, N. C.; Fred Simonds now lives at 8 Stafford Place, Larchmont, N. Y.

William Reed-Hill has returned to the East and is located at 29 Broadway, New York City. In a recent letter to the Institute he states that he is very much interested in a new type of tank for the storage of oil or gasoline such as is employed in plants or on yachts and calls attention to a safe and profitable method of avoiding the troubles incurred with other types. These tanks may be used anywhere in the United States with full insurance. If you are equipping a new yacht or motor boat, let Reed-Hill tell you about it.

The Boston *Traveler* for April 16 carried a series of pictures of Henry Warren with the statement: "Here's the man who harnessed time to electricity and electricity to time." The notice also called attention to the fact that Warren had been awarded the John Price Wetherell Medal by the Franklin Institute and the Lamme Medal of the American Institute of Electrical Engineering simultaneously. This, it states, was an unprecedented thing. We always knew that Warren was a great man and a genius.

The Class will learn with great regret of the death of W. M. Wheildon which occurred in April. After some years with the Westinghouse Company, he was associated with Henry Warren in perfecting the clock motor which made the Telechron possible. He also was an inventor of note. One of his sons, W. M., Jr., '30, took both his bachelor's and doctor's degrees at the Institute. Another son is a student at Harvard. In addition to his wife and these two sons, there is a daughter, and to all of them we extend sincere sympathy.

C. R. Boss, who had not been heard from for a long while, is now located at Gillette-Vibber Company, 32 Maple Avenue, New London, Conn. The latest news from Price indicated that he was spending the year at the Price Ranch, Los Alamos, Santa Barbara County, Calif. E. W. Abell is located in Folsom, Pa. He had not been heard of for a number of years. Dr. Will McJennett, who was not in the best of health at the last reunion, has given up his practice in

1894 Continued

Mount Vernon, N. Y., and his address is now Nealgate Street, Scituate, Mass. We certainly hope that his return to New England will be effective in restoring him to health.

The Secretary was, during the autumn, appointed by the Governor on a commission to study the public health laws and practices of the state of Massachusetts and is chairman of the subcommittee on sanitation. This is a job which has to fall in the category of public service, as the commission is unpaid. Nevertheless, it takes a good deal of time and numerous committee meetings at the State House. — SAMUEL C. PRESCOTT, *Secretary*, Room 10–405, M.I.T., Cambridge, Mass.

1895

The American Society of Civil Engineers made the award of the Rudolph Hering Medal to John H. Gregory, professor of civil and sanitary engineering in the Johns Hopkins University, in collaboration with Orris Bonney, sewerage relief engineer, Robert A. Allton, '13, sewage disposal engineer, and the late R. H. Simpson, chief engineer of Columbus, Ohio, for their paper entitled: "Intercepting Sewers and Storm Stand-by Tanks at Columbus, Ohio." This award was presented at the annual meeting of the Society in New York, on Wednesday, January 15. Since the endowment of the medal in 1924, it has been awarded only twice, in 1927 and in 1931. This is the third time that Professor Gregory has been honored by the Society. In 1910 he was awarded the Thomas Fitch Rowland Prize. In 1930, in conjunction with C. B. Hoover and C. B. Cornell, he was awarded the James Laurie Prize. All of the papers for which these awards were made have had to do with important advancements in the art of sanitary engineering.

Willard H. Watkins has found a new resting place at 535 Central Avenue, Bound Brook, N. J. — Professor William J. Drisko is now domiciled in Addison, Maine.

Probably many of you listened to the broadcast by Alfred P. Sloan, Jr., when he spoke in December at the annual meeting of the National Association of Manufacturers, in New York City's Hotel Commodore. He warned that "every dollar of the billions that have been indiscriminately spent without accountability is a mortgage on the income, the savings, as well as the security of the people. Industry must expand its horizon of thinking and acting. Business must assume the rôle of an enlightened industrial statesmanship to attack the problem of advancing the social and economic status of the community as a whole." He urged that business recognize its social responsibility to workers and all others. Interesting press comments on the meeting may be found in the *Literary Digest* for December 14.

It is with the deepest personal regret that we are forced to record the death of Edward H. Huxley, II, on December 11. Ned had been fighting poisoning of the blood stream for six weeks, and numerous blood transfusions were of no avail. A short service was held at his home in Tenafly, N. J., and on Friday morning, December 13, the funeral was held at Mount Auburn Cemetery Chapel, Cambridge, Mass. Booth, Eugene Clapp, Defren, Andrew Fuller, and Yoder of the Class were able to be present at the funeral. A little sketch of his life will be given in the notes for next month. — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass. JOHN H. GARDINER, *Assistant Secretary*, Graybar Electric Company, 420 Lexington Avenue, New York, N. Y.

1896

Charlie Lawrence contributes the information that he is now a grandfather for the fourth time, having acquired another grandson, named Peter Dunbar Lawrence, who was born in Syracuse, November 12. This makes Charlie's score as grandfather exactly balance, with two boys and two girls. — Mark Allen claims to have been up to his neck with work, trying to put up a new, modernistic building on a downtown lot in Detroit. He says that building is nothing new to him, but when it has to be one of the new glass and stainless-steel fronts, recessed lighting, and so on, it gets his goat. — Ralph C. Henry, in a talk before a dinner meeting of the Society of Associated General Contractors, held in North Hall, Walker Memorial, at M.I.T., on Friday, December 13, condemned the modern trend to copy from contemporaries as that type of action hastens the period of obsolescence of old standard planning.

Many classmates who read The Review thoroughly may not have realized that Lewis S. Tappan '28, whose death was reported to have occurred on May 28, was the son of our Lewis H. Tappan. The son was graduated from Course XV. He had been interested in photography and, at the time of his death, was taking pictures in an army bomber when it crashed in the West. — The son of another classmate, Frederick F. Schaller, who is a freshman this year at Technology, is following the footsteps of his father, residing in his father's old home town of South Natick, at 10 Schaller Street.

Still another son of a classmate, although not at Technology, has made a name for himself. Inwood Smith, the son, F. Haskell Smith, and a junior at Ohio State, is our contribution to Grantland Rice's All-America football team. He is a former high-school star of Mansfield, Ohio, and has been an outstanding guard at Ohio State and the bulwark of the great 1935 Buckeye grid machine. In his sophomore year he got into the line-up in the first game of the season and has been a regular ever since. He was also a member of the Ohio State basketball and track teams. His height is given as 5 feet 11 inches and his weight as 188 pounds. His father is naturally proud of him and reports that, although he has been doing mostly routine work and has not seen his name in print for outstanding performance, it is a gratification to be the father of such a prominent son.

Lou Morse has been elected president of the American Society of Refrigerating Engineers, and on Friday, December 6, he was inducted into office for a term of one year. He had been a member of this society since 1909 and served three terms as member of the Council. He has been particularly active in the work on various committees and is a recognized authority in refrigeration. In these days where a man seeks office rather than being sought for office, the Secretary naturally inquired of Lou as to how much it had cost him to get elected, and Lou indignantly replied that he had not made any campaign for the job and wanted classmates to understand that the nomination came to him entirely unsolicited and was like a bolt from the blue sky. Be that as it may, there is no question in the minds of all of us but that the affairs of the organization will be administered in fine fashion during this coming year with Lou Morse at the helm.

In the city of Cambridge at the present time lives Mrs. John Prescott, which may not mean anything to our readers, but when we identify her as the daughter of Clarence Perley, a report from her commands attention. She promises definitely that her father will be present in person at our reunion next June. — Admiral Bakenhus had the good fortune to be the guest of Admiral Reeves and also a member of his mess, during the war games last spring. There was plenty of work to do as to the shore establishment and, furthermore, the fleet had to work so that it was a strain for six weeks. Bakenhus also gave a talk before the Metropolitan Section of the American Society of Civil Engineers on November 21. His subject was, "Public Works of the Navy, Including Shore Station Power Plant Problems." In dealing with this subject he told of the many interesting engineering problems that had to be solved, such as the reconstruction of dry dock No. 2 and the replacement of the old obsolete coaling plant at the Brooklyn Navy Yard; but perhaps the biggest job of all has been the negotiation with the local utility company for a new contract covering the furnishing of power to all the Federal activities in the New York Metropolitan District. Bakenhus, as public works officer of the Third Naval District, was in charge of this project, and, as finally worked out, the new contract is estimated to save the Federal government $900,000 over a period of three years.

Colonel James Swett Smyser died in Quincy on December 15 and the body was taken to Pittsburgh, Pa., for services and interment. Smyser was born September 17, 1871, in Pittsburgh, the son of Jacob Henry and Caroline Frances Swett Smyser. He will be well remembered as one of the four Smyser boys who came to Technology in the Class of 1896. He was married in Washington, D. C., October 25, 1924, to Miss Alice Louise Ramsburg. From 1898–1910 he was with the General Electric Company in Schenectady and Pittsfield, 1910–1912 with the American Steel and Wire Company in

1896 Continued

Worcester, but since 1913 he has been engaged in private consulting and patent work. He was commissioned captain on February 13, 1918, and saw service in France. He was also with the army of occupation in Germany. He was discharged, October 31, 1919, and was later commissioned major in the Ordnance Reserve Corps, April 7, 1920. He was a 32d degree Mason and a Shriner. He was much interested in music, being a good musician himself. Jim attended class meetings, and was a good, serious-minded, loyal supporter of the Class and of Technology. His brain was always active, and he possessed marked inventive genius. For a number of years past he has been located around Boston, maintaining an office in town, and for a few years prior to his death he had made his home in Quincy. He suffered a slight shock last June, but more recently he had another and was confined to the Quincy Hospital for a few weeks before he passed away. — CHARLES E. LOCKE, *Secretary*, Room 8–109, M.I.T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1901

Get out your calendar and mark June 6 and 7 for our Thirty-fifth Reunion: a reservation has been made at the Oyster Harbors Club down on Cape Cod at Oyster Harbors, Mass.! From there we will come to Boston to attend Alumni Day, June 8. Judging by the present interest shown we should have the largest gathering since our graduation.

Archibald L. Klieves, who is now retired and lives at Wheeling, W. Va., recently made an auto trip to the Pacific Coast and while there had a short visit with Ellis F. Lawrence in Portland, Ore. — In the December Review I quoted Miss Gallup as saying: "I have been cooking up a project for a new Children's Museum." She writes me that I cannot read her writing. What she meant to say was she had been working on a project. Anyway, whether "cooking" or "working" she is to be congratulated on her success with the Children's Museum.

William J. Sweetser, professor of mechanical engineering, writes: "I am just starting my 21st year at the University of Maine, so feel that I am a full-fledged Maniac. I contact practically no '01 men in this neck of the woods, but am looking forward to the reunion and hope it will be at the Oyster Harbors Club where we had such a grand time at the last one. A young man called on me in our laboratory recently and introduced himself as the son of our classmate, J. Russell Putnam. He is taking graduate work in chemical engineering at M.I.T. and is now with the group located at the paper mill of the Eastern Manufacturing Company in Brewer, Maine." — ROBERT L. WILLIAMS, *Secretary*, 109 Waban Hill Road North, Chestnut Hill, Mass.

1904

Items of interest for these notes are very meager but are still of interest. Ralph Hayden, who has been located in Cambridge, Mass., for some time past, has left that city and is now located with the Walker Mining Company, Walkermines, via Spring Garden, Plumas County, Calif., as evidenced by a notice of change of address received from the Alumni Office dated October 2. — A clipping from the Boston *Transcript* of December 6 states that Dr. Herbert T. Kalmus of Centerville and Boston, President of the Technicolor Motion Picture Corporation, and Mrs. Kalmus sailed, December 7, on the French Line boat *Ile de France* from New York City, and continues to say that others sailing on the same boat were Lupe Velez and a number of other celebrities of the motion-picture world.

The remaining bit of information, for which I am indebted to Professor Locke '96, is about one of our classmates from whom we have not heard, Robert S. Hamilton. He has been relocated through his brother, Tom Hamilton '03, who reports that Bob at present is at Hilger, Mont. The old Hamilton estate at Lewistown, Mont., was sold after their parents died and the children dispersed, most of them living in Hollywood or San Diego. Bob, however, seems to have stuck to Montana and has been ranching. Recently he sold his ranch and is planning to spend the winter in Lewistown, with the thought that perhaps next spring he may go to some place on the Pacific Coast, perhaps out in Seattle, although he has a bug in his head to go to Alaska.

The above items are all that have come to my notice since the last ones were published in The Review, but, as is ever the case, I am in hopes that in subsequent issues they will be more voluminous. — HENRY W. STEVENS, *Secretary*, 12 Garrison Street, Chestnut Hill, Mass. AMASA M. HOLCOMBE, *Assistant Secretary*, 8 Rosemary Street, Chevy Chase, Md.

1905

Somewhere we have heard a song, "There Ought To Be A Law Against That." We could write an extra verse protesting against the idea of having to write class notes for the February issue two days before Christmas and invoking legislative action thereon. We might suggest that the Class should have elected a December Secretary but for the fact that the failure of any of our 400 assistant secretaries to send in a single item of news this month indicates that this business of being busy at Christmas time is universal.

Little did those of us who attended the reunion at Old Lyme last June dream that ere Christmas one of our number would have passed beyond. Charlie Hawkes, II, died on December 12 after an illness which had incapacitated him for the past four months. A few days before his death, he was operated on for the removal of a brain tumor which had penetrated so deeply into the brain that nothing could be done. He passed away, apparently peacefully, a few days later. Al Prescott, II, and Grove Marcy, II, were bearers at the funeral on December 15; others attending were Bill Ball, III, Charlie Johnson, II, Hub Kenway, II, and your Secretary.

Harry Wentworth, VIII, is the new president of the New England Golf Association and has recently been made one of two vice-presidents of the Newton National Bank. — Ed Poor, VI, was elected a director of the Massachusetts Golf Association at the last annual meeting.

A clipping from New York tells us that Francis E. Drake, II, is superintendent of gas operations for the Utility Management Corporation of New York. He is now residing at 439 Rochelle Terrace, Pelham Manor, N. Y. These new addresses have come in: James P. Barnes, 161 South Ann Street, Mobile, Ala.; Edward C. Grant, 2421 Glynn Court, Detroit, Mich. Letters to these addresses inquiring as to the meaning of change of base have so far been unanswered. Classmates in the vicinity please endeavor to put on a local tracer. — The post office at Rutherford, N. J., advised that Marshall Gage Meriam, II, had moved to Santa Monica, Calif. A letter to his supposed new address brought the answer from the post office that he had not arrived. Classmates at intermediate points please stand watch. — Has anyone information about Joseph N. Gladding, II, address Albuquerque, N. M., or Edgar L. Meyer, supposedly at Pasadena, Calif.? — FRED W. GOLDTHWAIT, *Secretary*, 175 High Street, Boston, Mass. SIDNEY T. STRICKLAND, *Assistant Secretary*, 209 Washington Street, Boston, Mass.

1906

By the time you read these notes it will be 1936 — a year noted for the 30th anniversary of the graduation of our Class. At this writing (December 20), plans for our reunion are already under way. In accordance with the custom started in 1935, the Institute has designated June 8 as the day for the annual Technology reunion. Under this plan, class reunions are to be scheduled to permit the classes to return to the Institute on this Alumni Day. Therefore, this establishes Saturday and Sunday, June 6 and 7, as the days for our reunion. Negotiations are already underway with the Oyster Harbors Club where we met in 1931. Please observe dates and place, and make plans to attend, so that our Thirtieth Reunion may be the best ever.

The Boston *Globe* of November 4 advised that Nugent Fallon, deputy general manager of the Home Owners Loan Corporation, has been appointed general manager of the Federal Saving and Loan Insurance Corporation, a subdivision under the Home Loan Bank Board; this appointment became effective December 1. The item included the following brief sketch of Fallon's career since graduation: "After he was graduated from M.I.T., he became a division superintendent of the Elevated, one of the youngest division heads of that company. He later was engaged in shoe manufacture in Newburyport. He joined the Royal Naval Air Service in the World War and was

1906 Continued

awarded a British medal for meritorious service but was forced to decline the decoration, as the United States had not then entered the World War. He later joined the American service and was recalled to this country as an instructor. Following the War he was treasurer of the French and American Bank in New York. He had been connected with the Home Owners Loan Corporation for many months before his appointment in January, 1934, as deputy general manager of the corporation."

Classmates will be interested in learning of the marriage of Joseph V. Santry on October 19 to Miss Mary Augusta Kemp Macready, daughter of Mrs. Robert Ashton Macready of New York. The Boston *Transcript* of October 15 included additional details as follows: "Miss Macready is the granddaughter of the late Robert Macready and Dorothy Madison Stone of Cincinnati, Ohio, and New York. On the maternal side her grandparents were the late William Kemp of New York, and the former Miss Louisa E. Jones of Brookline. She was graduated from Miss Mason's School, Tarrytown, N. Y., and Radcliffe College. Mr. Santry is a graduate of the M.I.T., a member of the Engineers' Club of New York and of Boston, a member of the New York and Eastern Yacht Clubs, and a former commodore of the Corinthian Yacht Club. He is executive vice-president of the Combustion Engineering Corporation in New York where he and his future bride will reside."

We are pleased to include items submitted by our New York correspondent, "C.F.W.W." Under the date of November 17 he reports meeting Mr. and Mrs. Philbrick of Hartford, Conn., in New York. Ray reports business as being good. The Philbricks have a daughter attending Smith College. A. E. Wells also reported in New York — he is now with the American Cyanamide. To quote our correspondent directly: "Recently, Cushman was here from Puget Sound. He is expert-ing on preservation of timber and is in the employ of two large concerns with headquarters in Washington State. I have seen Stewart Coey a couple of times. His multistage cooling tower is attracting attention because it brings substantial economies to those using large amounts of water in air-conditioning installations."

Again we are indebted to Professor Locke '96 for the following items: "A recent letter from Fay W. Libbey reports that he is now located at Aguila, Ariz., where he is operating a small mine in which he has a personal interest. He reports that early last June the heat in Arizona seemed to get on his nerves, so he decided to get out of it for a while, and consequently drove the family up to Seaside, Ore., where he spent three months, returning to Phoenix in September, where he left his family, while he went out to Aguila.

"Guy H. Ruggles, who has been for years mill superintendent of the Inspiration Copper Company at Miami, Ariz., has of late been sent by his company on special work to some sister companies in the same organization. He was for a considerable period with the Cananea Consolidated Company in Mexico, working on their problems, and more recently he has been around Salt Lake City on the milling problems of the International Smelting Company. — William J. Deavitt has joined the staff of Mogollon Consolidated Mines Company at Glenwood, N. M. — J. Edwin Griffin lives with his family at Bellevue Avenue, Langhorne, Pa. He has three children — two girls, 19 and 17, and one boy, seven years of age."

Our apologies to Henry Ginsburg. In a telephone conversation with him regarding the 30th Reunion, he reminded me that he has a son in the sophomore class at Technology. We are very glad to be able to report this fact, as it seems as though it is the exception rather than the rule for '06 sons to follow their fathers' footsteps and attend the Institute. — JAMES W. KIDDER, *Secretary*, Room 801, 50 Oliver Street, Boston, Mass. EDWARD B. ROWE, *Assistant Secretary*, 11 Cushing Road, Wellesley Hills, Mass.

1907

Someone has said that there is no need of a person apologizing to his enemies, as they won't believe him anyhow, and that it is unnecessary to apologize to one's friends. As I assume that you in the Class are my friends, I won't apologize, and yet I do feel disturbed to disappoint you for a second successive month when you look for the '07 notes and find so little to read. I can state only that efforts to secure items of interest have been unproductive of results.

A brief letter received from John H. Leavell states that last summer he was in the wilds of Canada and that he spent most of the fall in Arkansas. Stud is president of the Leavell Coal Company, producers of "Magic City coal," at Tulsa, Okla. — Arthur Tylee is at Forest Hill Village, Toronto, Ont., Canada. — We have a note from Clarence Howe, to whom we referred in the December Review, written on the letterhead of the Office of the Minister of Railways and Canals, Ottawa, Canada, so this apparently gives his correct address. — BRYANT NICHOLS, *Secretary*, 126 Charles Street, Auburndale, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1908

Mr. and Mrs. Gregory M. Dexter announce the birth of a son, Gregory Warren Dexter, on September 6. — We have the following changes of address to report: Horace E. Allen, 2248 Parkwood Avenue, Toledo, Ohio; Charles L. Batchelder, 1549 Fairmount Avenue, St. Paul, Minn.; George W. Everett, Illinois State Planning Commission, 1319 South Michigan Avenue, Chicago, Ill.; Dr. Pryns Hopkins, Department of Psychology, University College, Gower Street, London W.C. 1, England; Frederick W. Lyle, The Fairfax Hotel, Pittsburgh, Pa.; Joseph B. Sando, 320 Oliver Road, Wyoming, Ohio; Colonel Charles McH. Steese, Graduate School of Business Administration, Harvard University, Soldiers Field, Boston, Mass.

We regret to announce the death of Charles G. Ewing, but recently reported to us, though it took place on August 29, 1934. — H. LESTON CARTER, *Secretary*, 185 Franklin Street, Boston, Mass.

1909

Good progress has been made during the past month (November to December) on the Class of 1909 Scholarship Fund. Already papers have been completed for bequest insurance for 26 men, totaling $19,500, while others are in the process of making arrangements to contribute to the Fund. I expect to be able to publish in the March issue of The Review a more complete statement than is possible at this time, but this will serve to indicate a real desire on the part of the Class to make a substantial gift to the Institute.

From the Alumni Office comes the notice of the promotions from major to lieutenant colonel of Kenneth T. Blood and Fred M. Green. Blood is now at the Army War College at Fort Humphrey, D. C., while Green is on the Coast Artillery Board, Fort Munroe, Va. — Arthur F. Conant is vice-president of the W. L. H. Brown Mercantile Agency, Inc., New York City. — Under the auspices of Friends of the Soviet Union, Florence H. Luscomb gave a lecture in Tremont Temple, Boston, on December 11, on "Russia With My Own Two Eyes." Miss Luscomb had just returned from Soviet Russia.

Edward L. Ryerson is one of the four Chicagoans appointed by Chairman Fletcher to the Republican National Finance Committee. Ed is also one of the founders of the Illinois Republican Citizens' Organization. — Dan Belcher is still located in Minneapolis with Bemis Bros. Bag Company, where he superintends the making of huge quantities of flour bags. — George T. Southgate is engaged in the practice of consulting engineering, with offices at 114 East 32d Street, New York City. Last September there was released for publication a paper based upon an address which George delivered at a meeting of the power group of the American Institute of Electrical Engineers, New York Section, entitled, "Vibratorily Commutated Stationary Conversion." As Paul Wiswall said: "It impressed me because I don't understand a blessed word of it."

Thayer Hutchinson, daughter of Mr. and Mrs. B. Edwin Hutchinson, was married in Christ Church Chapel, Grosse Pointe Farms, Mich., on December 28, to William David Laurie, Jr. The young people will be at home after the first of March at 97 Merriweather Road, Grosse Pointe Farms. — Francis M. Loud is the new representative for Louisville, Ky., on the Alumni Council. — CHARLES R. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass. *Assistant Secretaries*: PAUL M. WISWALL, MAURICE R. SCHARFF, New York; GEORGE E. WALLIS, Chicago.

1910

Your Secretary received a small clipping as follows: "G. Bergen Reynolds is assistant superintendent of buildings for The Eastman Kodak Company, Rochester, N. Y., and lives at 165 Barrington Street." — The following was received from Jim Tripp: "I fully expected to attend the Twenty-fifth Reunion, but instead had to go West to bid on work. To bring you up to date concerning myself: When I reached California in 1910, I went surveying for a year and after that went into business for myself in the construction-supply game. Through this activity I gradually drifted into the contracting business and sold out my building-material interests in 1917. I missed the War by a few minutes and worked as an engineer, field superintendent, and general superintendent for Bent Brothers. While in their employ, I built several interesting jobs, the largest of which was the Little Rock Dam in California, a multiple-arch affair.

"In 1925 I formed a working partnership with Strange and McGuire in Salt Lake City and bid several million dollars' worth of work which we did not get. This arrangement fell apart naturally, and I drifted into the contracting-superintendent game. From 1926 to 1930 I enjoyed considerable prosperity and during that time built the Lake Pleasant multiple-arch dam in Arizona and the Coolidge Dam in Arizona, the Pardee Dam in California, also Section H of the River Desperes Sewer, St. Louis, Mo. The year 1931 I spent contracting on my own again and on January 1, 1932, I took charge of completing construction of Lock 15 at Davenport, Iowa, for the Merritt Chapman interests. In October, 1932, I moved back to New York City as 'pro-tem' construction manager for Merritt, Chapman and Scott, and remained there until January, 1934, during the reorganization and consolidation period in the depths of the depression. In January, 1934, I took charge of Dam 5 for the same people near Winona, Minn., completing that job about August this year. Merritt, Chapman and Scott and subsidiaries have recently gone back to their old form of organization, that is: East Coast, Middle West, and West Coast district offices.

"I am now located, temporarily, in Buffalo, starting the Black Rock-Tonawanda Basin dredging contract, which we hold under the name of the American Construction Company. I am vice-president of Merritt, Chapman and Whitney, headquarters, 515 Marion Building, Cleveland, Ohio. My duties are: general charge of all construction activities of the company from the Mississippi to Buffalo. What my next move will be depends on where the jobs are.

"I am very glad to know that you are in consulting practice for yourself and hope that you are enjoying a modicum of prosperity in these difficult times. — I hope something may bring me to Boston, when I will look you up and revive the memories of 26 years."

About two weeks ago, Art Stein called at the office to see your Secretary. He did not introduce himself, but your Secretary was able to call him by name without hesitation. As Art had not been around this part of the world for the last 25 years, it shows that he has not changed very much since he left the Institute. Art was visiting Boston on business for the National Electric Service Corporation, of which he is vice-president, and he is located at 25 Broadway, New York City. We had an extremely pleasant visit, talking over old times and discussing the various members of the Class — where they were and what they were doing. Art seems to have a complete knowledge of all 1910 men in and about New York City.

The following changes in address have been received during the past month: Roy M. Anderson, 30 Withra Street, Walla-Walla, Wash.; Guy W. Bolte, 47 Lexington Avenue, Greenwich, Conn.; Alfred Hague, 233 37th Street, Brooklyn, N. Y.; Ralph J. Haley, 1429 Laurel Avenue, Hollywood, Calif.; Walter T. Spalding, Spalding Construction Company, Inc., 820 Connecticut Avenue, Washington, D. C. — HERBERT S. CLEVERDON, *Secretary*, 46 Cornhill, Boston, Mass.

1911

Everything is all set now for our Silver Anniversary Reunion at the Mayflower Hotel, Manomet Point, Plymouth, Mass., on June 5, 6, and 7, and the committee, under the able leadership of Roger Loud, VI, comprises O. S. Clark, II, D. R. Stevens, II, O. W. Stewart, I, E. J. Whitcomb, X, Jack Herlihy, II, and O. B. Denison, VI.

Those of us who were at the memorable ten-year reunion in June, 1921, well remember the splendid appointments and fine food at Charlie Dooley's Plymouth hostelry, and the general reaction of classmates seems to be complete approval of the committee's decision to return there in 1936. Our celebrations will conclude there after breakfast on Monday, June 8, to enable us to drive to Cambridge and there take part in the Alumni Day festivities, climaxed by the alumni banquet at Symphony Hall, Boston, that evening. You all have the dates marked on your calendars and let's *all* make every possible effort to attend.

Bunny Wilson, XIV, Vice-President of the Aluminum Company of America, writes from Pittsburgh saying: "At this early date I cannot be at all definite in stating whether or not I will be able to attend the reunion, but you may be sure that if I do not it will be because of circumstances entirely beyond my control. I certainly have every intention of being there. I have been unfortunate in not being able to attend reunions since graduating and am looking forward to renewing acquaintances with a large proportion of the Class at the reunion."

He also adds an excellent suggestion, namely that "if each one of us had an up-to-date list of class members together with their courses, last known addresses, and, if possible, present business connections, it would be quite possible that in the course of our business and other outside contacts an appreciable number of the less active members of the Class could be directly or indirectly approached in a way which would increase their interest in and the probability of their attending the reunion." To a considerable extent this data is available in the 1935 "Register of Former Students," copies of which may be secured from the Institute for one dollar each, but this matter has been referred to the Reunion Committee to consider in connection with reunion publicity. Such suggestions are always welcome.

As the class dues are being received a number of the boys are following your Secretary's suggestion of writing a letter also. From Glens Falls, N. Y., Louis Wetmore, IV, writes that he will attend the Reunion if possible. His son, Louis, Jr., is graduating from M.I.T. this year in the Course in Architecture and Town Planning. His own architectural business having lapsed two years ago, he has been district manager with the National Reemployment Service of the United States Department of Labor in his section of New York State since that time.

From Toledo, Ohio, Ike Hausman, I, President of his own Hausman Steel Company, writes: "No news — just plugging away trying to keep up with the New Deal experiments." — Minot Dennett, II, with engineering office at 334 Lexington Building, Detroit, says he is "laying plans to attend the big Twenty-fifth at Plymouth next June and hopes nothing will prevent." — Norman Duffett, X, superintendent, Union Carbide Company, Niagara Falls, N. Y., says: "Mayflower Hotel in June is on my schedule and am looking forward to seeing you all."

C. R. Johnson, X, came up from Boston one day in mid December and we had a nice chat here at the Hotel Bancroft while he was waiting for an appointment with a client. He and Mrs. Johnson have recently returned from a highly enjoyable and profitable trip to Germany and he has promised a report of it for inclusion in these class notes. — Likewise, Lester Cushman, IV, stopped here while in Worcester to see a client and he said that he and his wife are hoping to be there next June. He is now with W. D. Cashin Company, 69 A Street, Boston, handling Therm-O-Flex heating specialties and Reading-Pratt and Cady valves and fittings.

In closing let me just repeat my admonition that every one of us should make every possible effort to attend our Silver Anniversary Reunion next June. Please reread the first paragraph. Thank you. — ORVILLE B. DENISON, *Secretary*, Hotel Bancroft, Worcester, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1912

The few stray items that have come to hand this month are all from Boston: Charles V. Reynolds, XI, advised us that

1912 Continued

his company, Reynolds Brothers, Inc., has moved from 179 Summer Street, Boston, Mass., to 10 Post Office Square, Boston, Mass. — Your Secretary had a pleasant chat with John Pettingell, I, on the Cambridge subway recently. John was "hot-footing" it for Worcester, where he had an order waiting to be "sewed up" before Christmas; he is selling air filters and reports a brisk demand. He reported also having been at the wedding of Charles D. McCormack's daughter recently. There may have been other daughters married in the Class, but this is the first that has come to our notice. All readers please speak up. McCormack is with the New England Fuel and Transportation Company, Everett. — Let's hear from some other part of the country. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown, Mass. DAVID J. MCGRATH, *Assistant Secretary*, McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N. Y.

1913

We learn with much interest that Jumbo Mahoney has left Clinton, Mass., and is now living in Burlington, Vt. He was connected with the Clinton Distillers, but apparently has moved into a more prosaic atmosphere. Perhaps Jumbo will let us know how he happens to be in Burlington. — Captain E. C. Gere has just finished two years as consulting quartermaster at Langley Field, Va. He is now a student at the Army Industrial College in Washington. — The Boston *Globe*, under the caption of Malden, Mass., carried recently the following item: "Edmund G. Brown, son of Dr. E. R. Brown, 164 Webster Street, has left for Maruata, Mexico, where he has accepted a position with a Mexican concern in the silver mining field. Mr. Brown returned three years ago from Russia where he was chief mineralogist for the Soviet government."

Information has come to us that M. W. Merrill is now residing in Plainfield, N. J., having moved from Woodbridge, N. J. — Phil Terry dropped in the other day for a social chat, having first called on MacKinnon (Registrar) in a business way. — Pa Ready sent us a brief note, the other day. — ARTHUR L. TOWNSEND, *Secretary*, Room 3-435, M.I.T., Cambridge, Mass.

1914

Your Secretary has been picked to act as chairman of the committee on Alumni Day which is to take place at the Institute on Monday, June 8. This is a new idea and was tried out just last year. It is hoped that, based on the experience of last year, it will be possible to add new items to make the day thoroughly worth while. Inasmuch as your Secretary is chairman, he would greatly appreciate it if members of the Class would write him "off the record," telling just what they would like to have take place on Alumni Day and the type of things that did not appeal last year. It is not necessary to have attended last year to write a letter on what you would like. Due to the fact that Technology gets out rather early and most of the student body has gone, it is quite impractical to have athletic events, which are the feature of Alumni Day in many colleges. The Institute, however, is thoroughly capable of substituting other events of real attraction.

Among his many other duties, Porter Adams has been appointed as chairman of the Aviation Committee of the New England Planning Commission. This Committee is to investigate the aviation situation in New England and draw up plans regarding the location of suitable airports and landing fields, together with the necessary communication means and beacons covering such fields and air routes. Your Secretary has agreed to serve with Colonel Adams on this latter phase of the work.

In the last few months we have been reading much about the improved conditions in the machine-tool industry. Having been hit fully as hard as other lines during the depression, it is exceedingly pleasing to see the industry now spurt forward. We know that real progress is going to be made, because at a recent meeting of the Machine Tool Builders Association, Norman D. MacLeod was elected president of that organization.

Dinny Chatfield has stepped up another notch in the United Aircraft Manufacturing Corporation. Formerly chairman of the technical advisory committee, he has been advanced to director of research. In this very rapidly growing industry the importance of the position is evident.

Perhaps not all members of the Class realize the variety of occupations the '14 men are engaged in. In this regard they may be interested in knowing that Horace G. Stewart is a practicing physician and enjoys an excellent reputation and practice in Cincinnati, Ohio, where he is now making his home. — HAROLD B. RICHMOND, *Secretary*, 30 State Street, Cambridge, Mass. CHARLES P. FISKE, *Assistant Secretary*, 1775 Broadway, New York, N. Y.

1917

Major L. E. Schoonmaker, in full charge of an expedition consisting of one automobile and a very bright looking son, Eric, age 13, moved on Cambridge and Medford late in November and departed after a brief stopping. He is now active in the Army's preparation for the defense of Texas against any possible renewal of Indian or Mexican aggressiveness and for invasion by Ethiopia. Schoonie was looking well, had all the dignity that should go with Majority, and seemed to be enjoying his leave of absence to the full.

As proof of the effectiveness of publicity — specifically the publicity given the Dionne quintuplets — we have word that John and Sally Holton have announced the arrival of twins, born in November. John is doing his best to see that they grow up in an air-conditioned world; he is continuing as one of the principal executives of the Carrier-York Engineering Corporation, to which position he fell heir when the Carrier and York organizations combined to become, on their own admission, the outstanding air-conditioning organization of the world.

Jack Wood has been showing up regularly at Alumni Council meetings, as a representative of the Providence Club. He has been drawn into a new and interesting undergraduate development at the Institute, the fostering of athletics in a form that can be followed actively after graduation. It is proposed that a fleet of dinghies be provided for use on the newly improved Charles River Basin in front of the Institute. Jack has been working actively with the sponsors of the new activity.

Possibly effected directly by the Tariff Reciprocity Treaty with Canada is Arthur D. Dickson. A considerable spurt in Port of Boston activities has been predicted and Dickson is associated with the most extensive terminal facilities in the metropolitan area for receiving, storing, and distributing bulk goods.

A letter from C. E. Turner to the worthy Charles E. Locke'96, professor of mining engineering and ore dressing and alumni correspondent extraordinary: "Please accept my most cordial thanks for your letters of introduction to Technology people, all of them have been most cordial. . . .

"In London, I had a delightful visit with J. T. Calvert'32. In Rome, we greatly enjoyed seeing Roberto Andreani '31, who, incidentally, is directing the regular broadcasts to America, called 'The American Hour.' In Greece, Dr. M. C. Balfour'19, did everything possible for us, as did E. S. Sheiry'24, at Istanbul. As you know, Dr. Balfour is in charge of the Rockefeller Foundation work for Greece and Sheiry is professor of civil engineering at Robert College.

"In Moscow, we had the pleasure of seeing Miss Anna Cheskis'34, who is a parasitologist in one of the government institutions. In Stockholm, we saw Mrs. Katherine Seidensticker Lemon'35. It was a pleasure to meet four of our former students in health education at the International Conference for the Protection of Childhood, at Brussels.

"In Geneva, several people mentioned having met most pleasantly Mr. Theodore Smith of our Department of English and History, who was in Geneva for the summer.

"From the professional point of view, I was particularly interested in the situation in Russia and Greece where engineers receive very high salaries compared with other professions — nearly twice as much as physicians for example. In Russia, this is obviously due to the tremendous need for technical service and to the realization that the engineer is doubtless making a greater contribution to the welfare of the people than any other professional man at present. Every schoolboy in Russia wants to be an engineer or an aviator. In Greece, the financial contrast between engineering and medicine is due, at least in considerable measure, to the fact that

1917 Continued

the technical school has rigidly restricted its number of students, while the medical school has not. There is a serious oversupply of physicians in Greece. Strangely enough, there seems to be more organization in the engineering profession than in the medical profession."

Calcutta University presented its budget estimates for the year 1935–36 for consideration by the government there, and many items of importance to the university were discussed. At the same time the recommendation was made that Dr. Clair E. Turner, chairman of the health section, World Federation of Education Associations, be appointed a special reader of the university to deliver a course of six lectures on subjects relating to organization of health education. The appointment was officially confirmed.

We add foresters to the list of specialists who studied anything but their specialty at the Institute. One Alvah Edgar Moody, pride of the Rockies, after a little CCC administrative duty has been specializing in forestry work both in Oklahoma and Colorado. Forester Moody has a presentation watch given as a testimonial of the tact with which he supervised the setting out of innumerable seedlings. An effort was made to supplement this information with data on F. O. Miller, formerly Course XI and listed as superintendent of the United States Forest Service at Lawrence, Kansas, but he was away when our special emissary called.

Neal E. Tourtellotte, who once managed undergraduate athletic affairs at the Institute, has skillfully disclosed to another athlete — Mexican — his continued interest in the subject. Mr. Tourtellotte has been given a chance to edit and correct his statement prior to this publication and having failed to make amendment we would assume that he intends to stick to his story: "You know exactly how strong I am for athletic life, since, as you will recall, you have never heard of me fishing, playing golf, or doing anything else like that. However, a couple of weeks ago I was invited to go on Bill Boeing's yacht, in the Canadian waters, for some fishing. I went along and had a great time. I haven't caught a fish since I was 13 years old, but I certainly made up for lost time. I am enclosing a photograph of some fish that I caught, this being the morning's catch. I duplicated the size of this catch, practically every morning and afternoon for two or three days. [*sic!*] These fish are salmon of the particular variety called 'silver,' weighing from nine to 12½ pounds. I caught them on a fly, with a light line and a four-pound test leader. [*sic!*] You have to play the fish, therefore, for a long time, usually about 30 minutes, in order to bring him along side the boat in a 'fainting condition' so he can be netted. The fish were laid on newspapers on the forward deck of the yacht and we forgot to strip off all of the paper when we took the snapshot — hence the peculiar appearance of two of the fish." Photographs attached showed such large fish that The Review refused to publish them, as being insufficiently substantiated. These wild claims preceded an eastern trip by the self-styled fisherman and there seems little doubt that there was some connection between the story and the trip — possibly an attempt to establish prestige. He was seen at the Plaza in New York but did not dare go into conservative New England territory. He returned to the Northwest to resume his position as an outstanding broker of delectable beverages.

W. Warren Rausch, a construction engineer in the Boston area who was with the Class only a short time in its early years but who will nevertheless be remembered by many, has recently burst into the news in connection with the Cambridge housing project. Rausch is acting district director of the PWA housing division and as such apparently has direct charge of the $2,000,000 housing project over which some controversy has recently arisen. The city of Cambridge is disturbed by the apparent plan to omit payment of taxes on this government property, and certain of the citizens owning tenement and apartment property which might be affected have also objected. Rausch has been quoted in opposition to these groups. What the status of the project will be when these notes appear and what will be Rausch's relation to it cannot easily be predicted.

Some years ago, Dudley Edwards Bell, with his excellent understanding of human psychology, appreciation for the dramatic, and unbounded energy, brought forth in Philadelphia a meeting of the Technology Club there that has become a measuring stick for all other local Technology affairs. It is referred to as is the blizzard of '88 in connection with New England storms. The largest turnout since that historic date gathered in the Adelphia on November 26, 1935. The speaker of the evening has been mentioned too frequently in these columns to permit of further publicity, but in the audience were: Dean Parker, still with duPont and busily organizing a new paint laboratory; Holt (Strawberry blonde) now with Grasselli; Walt Beadle, assistant director, development department, E. I. duPont; also, Dudley Edwards Bell. Reports and rumors have it that the meeting was interesting and successful, although less boisterous than the riotous affair the Chicago Club held last October. — RAYMOND S. STEVENS, *Secretary*, 30 Charles River Road, Cambridge, Mass.

1918

The Review's policy of collecting these patches of alumni history a full five weeks in advance of publication has always seemed to us a stultifying bondage. Here we are, glowing with strenuous Christian virtue, amid the scattered wrappings and bedizened ribbons that but an hour ago were so neatly arranged about the Christmas tree — here we are listening to a talk by the wise men of the Hayden Planetarium on how Jupiter, Venus, and Mars all combined to form the famous star in the East (no, we just turned that off in favor of the "First Noel") and when you get these drafty notations, an income-tax joke would be far more to the point. Really, it confuses us every month — even more than the pretty dilemma of trying to read a time-table after daylight saving has come in. Well, when you feel lean with the Roosevelt taxes (you're in debt $435 this minute and so is that eight-year-old son of yours) just let your frolic fancy reach back to the feasting and good cheer which is everywhere as these lines are scribbled.

In December, through the matchless courtesy of Professor Locke '96, it was our bright and precious opportunity to address a gathering of Alumni at Salem. Present, despite the tortured speaker, were such roisterous old Course II graduates as George McLaughlin and Ray Miller. George — the old Neanderthal bachelor — has been with the Turner Tanning Company in Peabody (a subsidiary of the United Shoe) since 1919. We made bold to suggest that there were other things beside leather, the tanning of which yields measurable profit — our 1923 model, for instance. The implication was that George . . . well, he repelled the horrid implication with some asperity. Ray Miller left engineering, with an irrepressible spasm of regret, to sell life insurance. No thanks, there is already an oppressive mortgage on the old homestead so that we can keep up our payments. Ray says he raises his three with a barrel stave and raises 'em often: Jack, age 13; Douglas, age eight; Lois, age four. Jack is no good at ancient history it seems, but enjoys watching papa play with his electric train.

David M. McFarland (the old meanie didn't furnish *Technique* with a picture so we cannot refresh our memory) is with the Atlas Powder Company, Wilmington, Del. At the New York show of the chemical manufacturers in December he saw Shorty Carr and Avery and C. C. Fuller. The old dynamite man had a stroke of luck a year ago when his boss got peeved one day and quit. Packey got the job as manager of the technical division, but not the emoluments — those to come later. He travels around the country a lot to places which a fragile child would not select: places in Oklahoma and Kansas and Missouri. Recently he says his car made 4,000 miles in 11 days, or maybe he meant the six-day bicycle riders. By way of Packey comes also the news that Jim Todd was, as of last May, still single and unspoiled. All right, all right. So long, until tomorrow. — F. ALEXANDER MAGOUN, *Secretary*, Room 4–136, M.I.T., Cambridge, Mass. GRETCHEN A. PALMER, *Assistant Secretary*, The Thomas School, The Wilson Road, Rowayton, Conn.

1921

Another reminder — our big celebration of our 15th anniversary next June during the week-end just preceding Alumni Day on Monday, June 8. Plans are rapidly taking final shape for what promises to be the best get-together we have ever had. Varied activities insure a

Plan to attend Alumni Day at M.I.T. on June 8, 1936

1921 Continued

good time for everybody with plenty of opportunities to relive the days which form our common bond. Transportation will be available to Cambridge for the Alumni Day program. Note the dates and do your share to make the success of the reunion complete by scheduling your attendance now.

Hawaii, once a far distant territory now drawn closer by whirling blades, gives us news of alumni doings. Our thanks to neighbor William C. Furer '06 for verbally telling of the election of Harry P. Field to the presidency of the Engineering Association of Hawaii, Honolulu, succeeding C. W. Dickey '94. Secretary Furer's account gives evidence that the passing of years has not dampened Harry's ardor for organization activities and we hope he will forego his duties with the Hawaiian Electric Company long enough to be among those present at our coming reunion and atone for his broken promise to attend in 1931!

Fred M. Rowell is manager of the Plymouth Electric Light Company, and makes his home at 16 Cushman Street, Plymouth, Mass. Francis Hill is attending Northeastern University Evening School of Law. Russell C. Johnson is with the American Smelting and Refining Company and can be reached at Apartado 55, Chihuahua, Mexico. Jackson W. Kendall, who annually helps make the Rose Bowl famous, has changed his address to 1295 Elizabeth Street, Pasadena, Calif. Lawrence W. Conant is now at 3008 Ordway Street, N. W., Washington, D. C., and an explanation of why he left our own native North Carolina is forthcoming! The Atlantic is responsible for C. D. Greene's removing to 149 Mount Joy Place, New Rochelle, N. Y., but we don't know which Atlantic — gasoline or the lure of aquatic sports.

Rev. Samuel H. Miller, pastor of the Old Cambridge Baptist Church, writes from 17 Ware Street, Cambridge, giving a fine account of his doings since the year he spent with the Class before studying for the ministry: "Enlisted Marine Corps, 1918; in field engineer's office during construction of South Yard, New York Shipbuilding Company, Gloucester; married Miss Myra Studley of Collingswood, N. J., October, 1918; entered Colgate University, 1919, and was graduated with B.Th. degree, Phi Beta Kappa, in June, 1923; pastorates since then in Belmar, N. J., Arlington, N. J., Clifton, N. J., and in Cambridge since August, 1935." A cheery greeting and the assurance of his attendance at our Fine Fifteenth earn our everlasting gratitude to Sam for his thoughtfulness in writing.

With which shining example, we again appeal to you all for news of your doings. Don't put it off — send in a card, a short note, anything — but do it now! — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, Acousticon Division, Dictograph Products Company, Inc., 580 Fifth Avenue, New York, N. Y.

1922

The long arm of the law has nothing on us when it comes to reaching out to various corners of the earth to get our man. Antonio T. Penna, who took the Mining Course at the Institute, is a man for whom there has been no active address for a few years, and efforts to locate him have not met with much success until recently. We are happy to report that his present address is Praca Pedro II — 22, Belem, Estado do Para, Brazil. After graduating, Penna went to the St. John del Rey in Minas Geraes, a famous gold mine which in depth competes with the gold mines of South Africa. From there he returned to his home in Rio de Janeiro and went to work with the Brazilian Traction Light and Power Company, and later was with the Cia Telephonica Brazileira, a telephone company owned by the Brazilian Traction Light and Power Company. He left that job in October, 1933, and went to the City of Para in the northern part of Brazil to take care of some farms owned by his father there. For the above information we are indebted to Alexandre H. Leal '35, the Honorary Secretary for the Institute at Rio de Janiero.

Ken Coachman is sales representative for the Taylor Instrument Companies, Rochester, N. Y., and makes his home at 1074 Teviot Road, Schenectady, N. Y. — Charles Dearstyne is now inspector of public building reconstruction for the state of California and lives at 640 Santa Clara Avenue, Venice, Calif. — The state of everyone's health in Newton, Mass., is being guarded by Keble B. Perine, who is health officer for that community and lives at 242 Islington Road, Auburndale, Mass. — Sid Biddell is now living at 514 Shore Road, Mamaroneck, N. Y. — Frank Gage, of Tech Show fame, has moved from San Francisco, Calif., to Minneapolis, Kansas; please note, "Kansas." According to the 55th edition of the "Rand McNally World Atlas," Minneapolis is located in Ottawa County, is equipped with a money-order post office, is a banking town, has a Western Union Telegraph office, American Railway Express facilities, and, in the year 1924, boasted of a population of 1,842 souls.

Cliff Gayley has moved from Brantford, Conn., to 3422 81st Street, Jackson Heights, L. I., N. Y. — Ted Miller, who has been representing the Dewey and Almy Chemical Company in Paris, France, has apparently returned to his native country, since his present address is the Cambridge, Mass., headquarters of that company. — John Plimpton, after residing in Riverside, R. I., is now located at Warmwood Hill, Mansfield Center, Conn. — Jack Sheffield commutes from New York City to the International Agricultural Corporation, Mulberry, Fla. — Lieutenant Colonel Thomas-Stahle is chief of the Air Corps, Manila, P. I. — Larry Vadner has moved from New York City to 210 Avon Road, Narberth, Pa.

We have one wedding to report this month, that of Dr. A. Harold Radin, to Miss Irene Lieberman. The wedding took place in Brookline. After graduating from the Institute, Dr. Radin took his medical degree at the Tufts Medical School. He is now attending surgeon at the Boston City Hospital, Beth Israel Hospital, and the Boston Dispensary.

Although, while sitting here in Rochester on a dreary cold December afternoon, it seems a long time to next June, let me call your attention to the Alumni Day for 1936 at the Institute, which has been scheduled for Monday, June 8. If any of you gentlemen are planning to make a trip to Cape Cod, Martha's Vineyard, the Coast of Maine, the White Mountains, or any other of the New England vacation spots, it might be well to remember that date. The Class of 1922 will not hold a regular reunion until the following June, but the Institute always welcomes members of all the Classes on its annual Alumni Day. — C. KING CROFTON, *Secretary*, Rochester and Pittsburgh Coal Company, 604 Lincoln-Alliance Bank Building, Rochester, N. Y.

1923

But for a letter from Phil Coleman, XV, who is now in New York with Standard Statistics Company and living at the Shelton Hotel, the notes are limited to the following items which have drifted in through the Alumni Office. — Irwin W. Alcorn, II, who has been sales engineer in Tulsa, Okla., for the Oil Well Supply Company for several years, has resigned to become division engineer for the Pure Oil Company, with headquarters in Houston, Texas. — Dr. Charles S. Keevil, X-A, is head of the department of chemical engineering at Oregon State College, Corvallis, Ore. — Melville F. Taylor, III, is district manager for Gardner-Denver Company, Pittsburgh, Pa. — HORATIO L. BOND, *Secretary*, 195 Elm Street, Braintree, Mass. JAMES A. PENNYPACKER, *Assistant Secretary*, Room 661, 11 Broadway, New York, N. Y.

1926

Der Konvergenzpunkt, the Secretary's mechanical assistant in the work of gathering gossipy morsels for this column, has stripped a couple of gears and burned out a tube, with the result that virtually no news is available for this issue, save a few important items gathered by the Secretary himself.

Red Elmendorf, engineer with the Cleveland Wire Works of General Electric, called by the office recently during the course of a business trip. He has survived the rigors of living in Cleveland extraordinarily well. — I. R. Macdonald is doing research for the Sheaffer Pen Company in Fort Madison, Iowa. — Raymond Mancha, the man who is almost as tall as Dave Shepard, is with the Jeffrey Manufacturing Company in Columbus, Ohio. — Herbert L. Beckwith, one of the Rogers group (I do not refer to statuary), is assistant professor of architecture at the Institute.

I remind you again that our Tenth Reunion is scheduled for June 6 and 7. Every effort is being made to provide an

1926 Continued

interesting program for what will probably be the largest gathering of '26 men in the history of the Class. Plans now include a luncheon at Walker Memorial on June 6 prior to leaving for the scene of the reunion, which will probably be in a comfortable resort hotel south of Boston. — J. RHYNE KILLIAN, JR., *General Secretary*, Room 11–203, M.I.T., Cambridge, Mass.

1927

Your Assistant Secretary has a small amount of news at hand. Word has come to us that Al Kauzmann is now a development engineer for RCA-Radiotron Company, Harrison, N. J. For the first two years after graduation, Al was an engineer for the Champion Radio Tubes Company at Danvers, Mass. He spent the following year studying physics in Munich, Germany. Since 1930, he has been with RCA. Al is married, and his daughter, Caroline, is a young lady of about one year.

W. H. Hutchison is with the organic chemicals division of the duPont Company, with headquarters in Providence. He is living at 26 Paterson Street, Providence, and is working the New England territory. He has been married six years and has one youngster who was born on July 22 of this year. — A wedding announcement tells us of the marriage of Miss Evangeline Koenig and Edgar Marburg on Saturday, August 31, at Edgewood, Pa. Sorry we cannot give you any further information concerning Edgar. — Bruce Sherrill, whom we have reported previously as being with the Grinnell Company of New York, has taken an apartment at 320 East 42d Street. Your Assistant Secretary spent a pleasant evening with Bruce the latter part of the summer, and I know that he would be glad to see any of the boys when they are in New York.

One of the purposes of the 1927 column in The Review is to acquaint members of the Class with news of what the other boys in the Class are doing. If you will review the notes, occasional as they have been for the past year, you will see that a few people have been mentioned two or three times. The reason for this is, no doubt, obvious to you: In an attempt to keep the 1927 class notes alive, your Assistant Secretary has been forced to report news on those local men whom he sees more or less frequently. Neither the time nor the money is available to get together a questionnaire to be sent as a broadcast to the whole Class. Therefore, the voluntary coöperation of those of you who are interested in keeping the Class an entity will be greatly appreciated.

Inasmuch as the Alumni Association will not hold the usual winter dinner this year, because of the home-coming arrangements for June, the prebanquet get-together will not take place this winter. However, if there are men in this locality interested in having a class dinner in June in conjunction with Alumni Day, notify your Assistant Secretary of your address and your desire, and an attempt will be made to get the boys together for an enjoyable evening. — JOHN D. CRAWFORD, *General Secretary*, General Radio Company, 30 State Street, Cambridge, Mass. RAYMOND F. HIBBERT, *Assistant Secretary*, The Gill Corporation, 238 Main Street, Boston, Mass.

1928

One more member of our Class has joined the ranks of the benedicts. Sam Weibel of Course I was married on November 24 in Bayonne, N. J., to Miss Elsie Diedsch, daughter of Mrs. Annie Diedsch of Westerleigh, Long Island. Sam is still in New York City working as a consulting engineer with Clyde Potts at 30 Church Street. To Mr. and Mrs. Sam the Class extends its heartiest congratulations and best wishes.

In behalf of the Class, may I wish to all you men of '28 a prosperous and happy New Year — and just incidentally on my own, may I ask you fellows for a little more coöperation to keep this column filled with news. — GEORGE I. CHATFIELD, *General Secretary*, 5 Alben Street, Winchester, Mass.

1933

A couple of the letters I received this month are welcome news from two fellows we haven't heard from in some time. Frank Vanucci, out in Newark, Ohio, writes in part: "Frank MacMahon is the only one I hear from. He is still in Boston working for the Gas Company, but doing his best to get into aviation. I saw Willmann last summer. He is with Whiting's Milk Company as a cheese expert or something. Bill Sheppard is with Budd Manufacturing Company in Philadelphia. I haven't heard from him for about three months or so. — I'm working in the laboratory here with thermal conductivities and radiation, with respect to our insulating wool and other types. Recently we received a spark apparatus for making spark photographs (from the Institute, I believe) and so now I'm an amateur photographer. Some fun!"

And here's part of what Frank Lopker has to say: "I have been traveling for something like a year and have only recently located here in Los Angeles where I am working in the engineering department of the Western Pipe and Steel Company of California. Here is one little bit about Ed Lloyd: He writes that he is still single but has bought a ring. That is probably old stuff to you as his letter was written a month ago." The news about Ed is new to me Frank — Congratulations Ed!

And here's some items from the society columns: The wedding of Miss Dorothy Ferguson and Laurance Sibley on November 23; the marriage of Miss Phyllis McElhane to John K. Campbell on November 10 (Campbell is on the staff of the Consolidated Gas Company of New York); the wedding of Miss Winnefred Moretan and William Laird on October 19 in Wilmington, Del.; the marriage of Miss Wilma Golding to Robert Hedges on November 23 in Medford; the marriage of Miss Hannah L. Harkness to Robert Love on January 13 at Hastings, Mich. — the best of luck to all of you.

From the Meriden (Conn.) *Record* of November 5, we read of the doings of Norman C. Theobald. He is vice-president and general manager of the newly founded Connecticut Radio Corporation, handling a complete line of radio and electrical equipment. Keep up the good work! — And that's all we have to say for this time. — GEORGE O. HENNING, JR., *General Secretary*, 163 Barbey Street, Brooklyn, N. Y.

COURSE III

John Rumsey recently wrote me an interesting letter about activities in Detroit, where he is at Chevrolet-Forge making good use of his metallurgy. He recently helped to discover and iron out various difficulties in the plating of automobile bumpers; he has also been running tests on carburizers and on the annealing cycles of certain alloy steels. The Detroit Technology Association, of which John is the newly appointed treasurer, is, according to him, very active. Out of a membership of 250, he claims an attendance of 50 to 100 at the monthly meetings. He doesn't explain how such a good record is maintained, but the reason is evident when he tells of a recent meeting in Detroit's largest brewery, Stroh's Brew House. The speaker at that meeting was assisted in answering questions by Bud Haas, the assistant brew master at Pfeiffer's Brewery. From John comes news of Mal Mayer at the Wolverine Tubing Company in Detroit and of Huntley Child, Jr., who is in the engineering department of the Murray Corporation. A couple of months ago Jim Mills paid a visit to Detroit and his Sigma Nu brother, Dick Taylor, who spent a year at Tech.

From Chicago comes news from Louis Alpert. He is very enthusiastic about his job at one of the American Smelting and Refining plants. In his words: "The plant deals only in secondary metals and it sure is the coming metallurgical business. There is so little known and so much to be found out about this phase of metallurgy that I sincerely believe I have a splendid opportunity." We hope so, Louis. From him comes the news that Cohen is working on his thesis after passing his doctors' exams. Kessler is back at Weirton Steel, and Sanchez has been working for the past year at the American Steel and Wire in Cleveland.

Several times lately I have seen Mason Culverwell. He is still with Bethlehem at Sparrows Point where he translates the customers orders into suitable specifications for the production units. On the side, he is studying law, and his room looks like a young law office. — This ends another episode in the history of Course III. — EMERSON S. NORRIS, *Secretary*, Davison Chemical Company, Baltimore, Md.

1935

Starting this time with a marriage announcement: Les FitzGibbon and Miss Sarah Miller were married, last June 21.

1933 Continued

A bit late with the news, but we wish them many years of happiness together. Dan Cupid did his work well last month, for here are a number of engagements: Miss Jean Wegener and Lowell Lammers, Miss Dorothy MacDonald and George Fickett, Miss Doris Payne and Bob Carr. Best wishes to all of you.

Lorin Presby wrote a short time ago. Pres is working for the Phoenix Engineering Corporation in New York City. The company does estimating and designing for power and light companies, and Pres has been working on hydraulic studies for prospective hydroelectric plants. Hugh Fenlon is working in New York also. He is with the Electric Bond and Share Company in their rate department. Lieutenant Rush B. Lincoln, graduate student in Course I last year, has reported to the commanding general for duty with the Corps of Engineers on the Panama Canal. Nick Kuehn, I, is working for the Chicago Water Purification Division as a junior sanitary engineer. He is doing graduate work at Armour Institute during spare time and is studying sanitary engineering.

George Kevorkian spent two weeks each at Fort Wright in New York and Fort Adams in Rhode Island. Since September he has been working for the firm of Metcalf and Eddy in Boston. He has been doing a mixture of things, including machine design, mechanical drafting, and a little hydraulics. He seems to think it is ages since he saw a group of Tech fellows together.

In Course IV, George Lykos won the Medary Scholarship of the Institute of Architects and he will continue with graduate work at the old factory. Sam Paul has a scholarship and is doing graduate work at Harvard School of Architecture. Dick Parli is working for the government in Washington. He is trying to get into the procurement division of the Treasury. Kelsey Saint, who was at Tech for three years and then transferred to Yale, is in that division. Art Cohen is working on construction at the Passamaquoddy Bay project in Eastport, Maine.

Perk Ehrlich started in right after graduation as an assistant (paid!) to Professor Davis in the organic department. He worked at this right up until school started again and he is still back at the "madhouse" trying to get a master's. During the summer he commuted 16 miles to school on a bicycle. He is at present trying to scrape together the necessary parts to build a small telescope. I guess Perk is "starstruck." — Alexandre Leal reports that since his return to Rio de Janeiro last summer he has been kept busy. Soon after his return, he secured a position as junior engineer of the Rio de Janeiro Tramway Light and Power Company, which is the public utility company operating in Rio. The work calls for trips to generating plants, and so on.

Course VII news consists of the fact that Jerry Farr is working as biochemist at the Readville Distilleries, Inc. in Readville, Mass. He reports also the glad tidings of a birth in the family, a daughter, Ramona. He has been setting up his own lab and trying to learn the distilling business thoroughly by means of textbooks, pamphlets, and so on. He asks any Alumni who are in a similar business to help him out with any information they may be able to send to him.

Course VIII did a bit better than the others this time. Baldwin Anciaux and Henry Lambert '34 are now located in Barbados, B. W. I., where they have established the firm of the Barbados Radio and Electric Company, in the heart of Bridgetown, the capital city of Barbados. As a stimulus to their sales they are establishing a library of technical and semitechnical books and periodicals, and they hope to make their office the meeting place for all interested in radio, electricity, or other scientific subjects. Furthermore, they want to make it Technology headquarters for any among the residents of the Barbados who desire information about Technology and also for any visitors, especially Technology Alumni among the voluminous tourist traffic which reaches the British West Indies. There are quite a number of the fellows back at school: Will Crout (still throwing the hammer), Harold Farr, Jim Killian, Jake Leeder, Ernest Nordberg, Charlie Sutton, and Howard Tatel. Charlie Sutton tried to convince duPont that they needed a Hardy color analyzer for their auto paints with Charlie thrown in as the operator, but they seemed to think that young high-school kids with keen eyes could do as good a job. Bill Parker, with National Color Pigment, is saving money by omitting dates. It seems that all the beauties depart with the summer, leaving only the common chaff. He has made a number of trips to New York and has done some sailboating on the Hudson. A rumor has it that Bill has been promoted. He had been working in the chemical laboratory, probably washing test tubes; now, I suppose, he is using the test tubes. George Valley is with Bausch and Lomb, "learning the optical business from A to Z." He thinks it a "swell company to work for," and when last heard from expected to be assigned to the scientific bureau. Shea Alice LaBonté is back at school with an assistantship to Professor Schwarz. Harold Oshry is wrestling steel for U. S. Steel Company in Pittsburgh. Harold is in the research laboratory and likes the work and life there, calling them "*très jolis*." Dick Jarrell, the source of most of this dope, is working for Spencer Lens of New England. He repairs microscopes and makes trips to demonstrate equipment. He has been to the University of New Hampshire, Dartmouth, Norwich, University of Vermont, Smith, and Massachusetts State. He says that he has seen more of Wellesley in a business way than he ever did in social activities. Hart Livingston went through the Canal from San Francisco to the East Coast, visiting some of the gang down at the big ditch. I haven't found out where he was headed.

Gene Nohl has had some interesting experiences since graduation. To continue the work which he started as a thesis, he bought a 40-foot sloop and fitted her out with all the equipment required for underwater investigations. He spent the entire spring and summer experimenting with some ideas he had about the work and in diving to wrecks off the Massachusetts coast. He investigated the salvage value of the *Port Hunter*, a 480-foot Shipping Board vessel sunk off Martha's Vineyard, and the rum runner, *John Dwight*, a 110-foot steamer sunk in 90 feet of water with an alleged cargo of liquors. He is at present busy with plans for continuing the work next spring.

Course XV is a runner-up to VIII for news this month. Roger Hammond is working in New Jersey for the Mack Molding Company. It is a small outfit in the bakelite molding game. He is very well pleased with his work, which consists of scheduling and material control, especially when trouble arises. Dave McIntosh is at the same company and has chances of becoming the laboratory "chief." Charlie Bowen is at General Electric in Bloomfield, setting rates. Dick Shaw, Utley Smith, Jack Tebbetts, and Greg Fry are working for Travelers Insurance Company, trying to put it back on the road to prosperity. They have been doing routine clerical work so far, but expect to rate a private office and a staff of secretaries any time now. Rumor has it that Fiske King is doing something or other in Ambler, Pa., probably giving the girls a break there. Last spring at the Delta Psi beer party, Bemis, Duff (what Duff), Wetherill, and Stevens put in their smiling appearances. They all looked disgustingly healthy and prosperous. Ian McFadyen is working for General Electric in Cleveland. Jack DuRoss, who dropped out during his junior year due to injuries received in an accident, is among the Lakewood (Ohio) younger fashionables and is making a fortune selling dog food. He claims that dog food is the country's second largest canning industry; he doesn't mention what is first — maybe it's running places like the Institute (credit for this crack to Jack Ballard). Jack Colby is working for Johnson Service Company in their Boston Office. They design, manufacture, and install control systems for heating and air conditioning. His work is entirely sales engineering. He spent two months in the Chicago office and the Milwaukee factory learning all about a thousand and one instruments used in control work.

Incidentally I received a letter from some member of the Class, unsigned and with no return address. It was dated the 11th of December and contained about seven typewritten lines, so if any of you sent a letter about that time and of about that length, make yourself known. — ROBERT J. GRANBERG, *General Secretary*, 172 Water Street, Eastport, Maine. JOHN D. HOSSFELD, *Assistant Secretary*, 23 Hale Street, Beverly, Mass.

Plan to attend Alumni Day at M.I.T. on June 8, 1936

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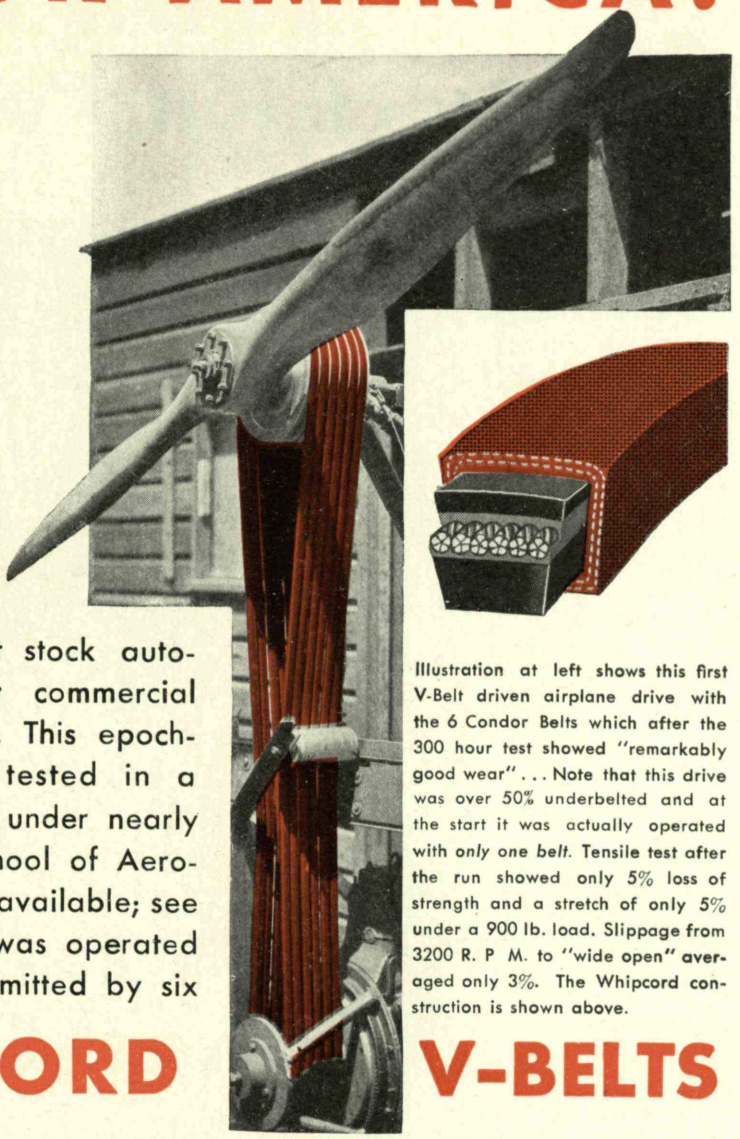

The end of the long road to the development of a practical "flivver" airplane is in sight. A way to drive an airplane propeller from a low-cost stock automobile motor, fueled with ordinary commercial grades of gasoline, has been found. This epoch-making drive has been thoroughly tested in a government-supervised endurance run under nearly flight conditions at the Casey Jones School of Aeronautics at Newark, N. J. (Official report available; see below). The engine-to-propeller drive was operated for 300 hours, the power being transmitted by six

Illustration at left shows this first V-Belt driven airplane drive with the 6 Condor Belts which after the 300 hour test showed "remarkably good wear"... Note that this drive was over 50% underbelted and at the start it was actually operated with *only one belt*. Tensile test after the run showed only 5% loss of strength and a stretch of only 5% under a 900 lb. load. Slippage from 3200 R. P M. to "wide open" averaged only 3%. The Whipcord construction is shown above.

Condor WHIPCORD V-BELTS

It is significant that Condor V-Belts were selected for the drive. *These were stock belts.* The endless Whipcord strength member placed in the neutral axis area, a design originated by Manhattan, makes such performance possible. For you, at the present moment, the important conclusion to draw is this: Since Condor V-Belts have the strength and wearing quality to enable them to pass such a grueling test with "flying colors", they must certainly be *the* belts for your industrial drives. They cost no more. Their outstanding performance is entirely due to their

8-POINT BALANCED CONSTRUCTION

1. Minimum Inelastic Stretch
2. Wide Margin of Strength
3. Uniform Flexibility
4. Maximum Resistance to Structural Breakdown
5. Smooth Running
6. Maximum Traction
7. High Resistance to Side Wear
8. Correct Lateral Reenforcement

Let us send you the Air Commerce Bulletin (left) describing the Casey Jones test with Condor V-Belts and our latest General Catalog and V-Belt Engineering Data Book (right) giving full particulars on Condor Whipcord V-Belt construction.

Sold by Leading Jobbers — Manufactured by the Makers of Condor Products.
Belt, Hose, Molded Goods, Industrial Brake Lining, Rubber Covered Rolls and Tanks.

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A *New* G-R Precision Condenser

Temperature Coefficient of Capacitance: 22 parts per million (+0.0022% per degree C)

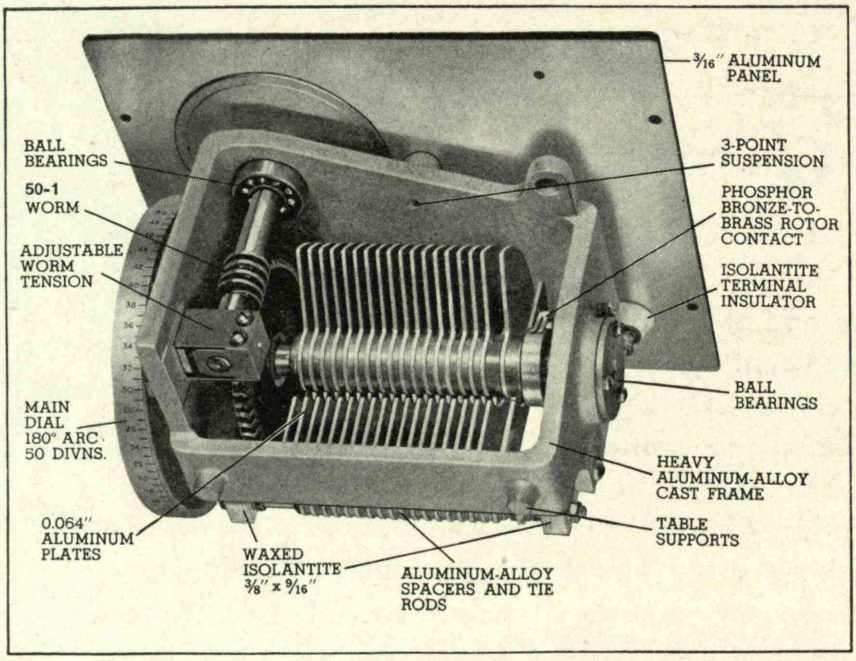
Figure of Merit $R\omega C^2$: 0.04×10^{-12} (constant over audio range from 500 cycles)

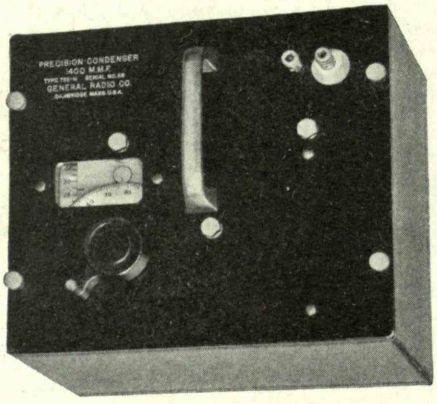
Residual Resistance at 1 Megacycle: 0.02 ohm

Inductance: 0.06 μh

Figure of Merit Unchanged up to 75% Relative Humidity

Vernier Can Be Read to 1 part in 20,000





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for complete details. Either model can be shipped from stock. *Address:*

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including calibration at 26 points accurate to 1 $\mu\mu$f or 0.1%. **Worm correction calibration,** accurate to 0.1 $\mu\mu$f or 0.1%—**$35.00 additional.**

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